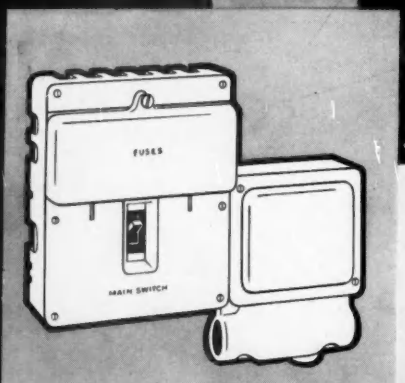
5 AUGUST 1954

NINEPENCE

ELECTRICAL TIMES

FLEXIBILITY of arrangement to suit all domestic installations



FUSEWAYS INTERCHANGEABLE — unused ways shielded. The eight ways can be arranged in any desired sequence (5, 15 and 30 A) by use of the appropriate turrets which are interchangeable in the bases. The turret prevents householder inserting the wrong fuse carrier. Blanking covers shield unused ways.

COLOUR AID TO FUSING. Fuse-link, carrier and turret are coloured according to rating.

SPARE CARTRIDGE FUSES are kept in a handy compartment in the lid.

ROBUST MAIN SWITCH. HENLEY 60A Double-pole Slow-break Switch.

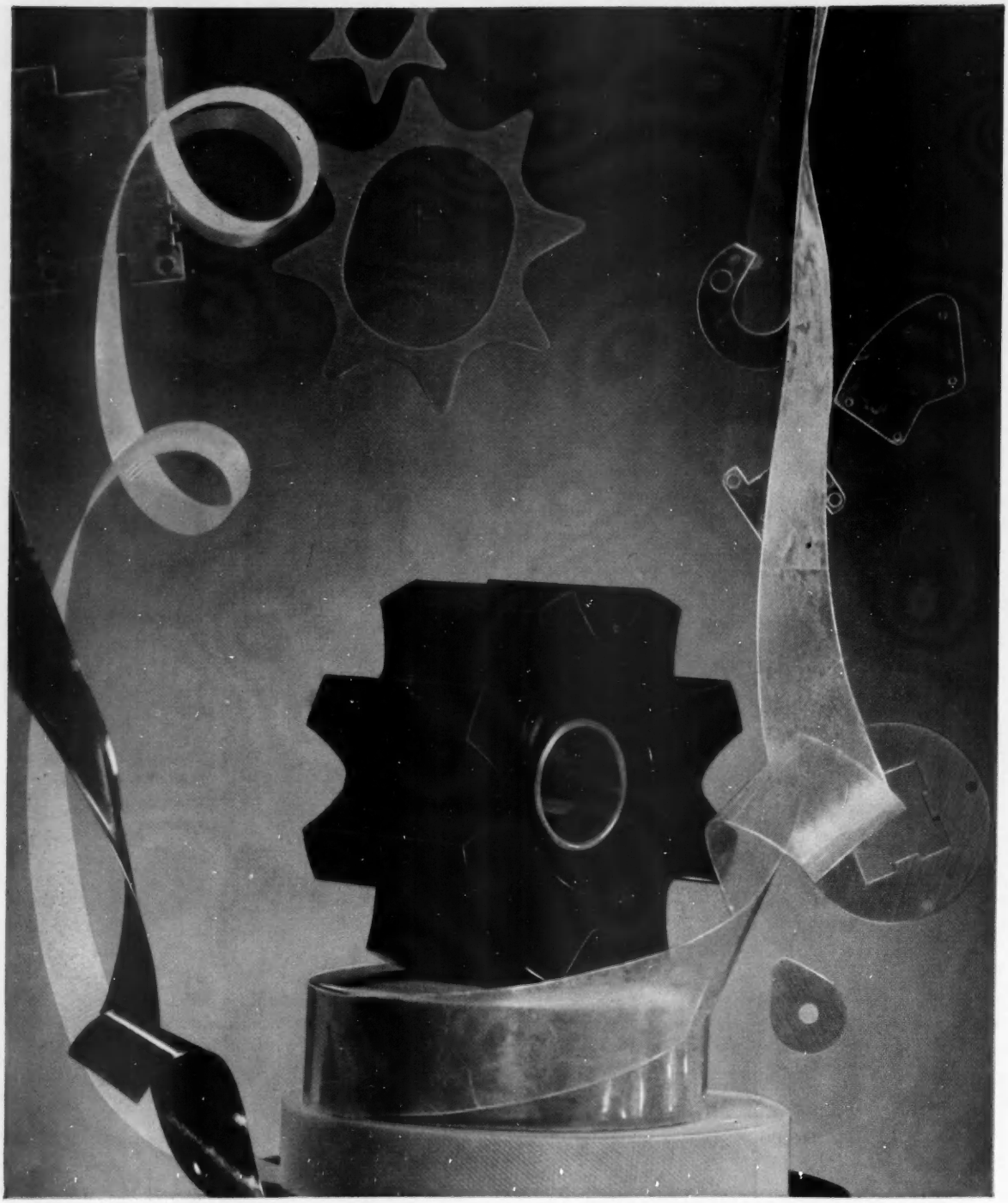
HENLEY

CONSUMERS' CONTROL UNITS

Please write for full details

INSULATED TYPE

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1



Examples of our many activities. The pump impeller is a Panilax Resin Moulding and is supported upon rolls of Mica tape and Empire tape. The punchings include Micanite, Paxolin Laminated and Mica.

m and i

THE MICANITE & INSULATORS CO. LTD

EMPIRE WORKS · BLACKHORSE LANE · WALTHAMSTOW · LONDON · E.17

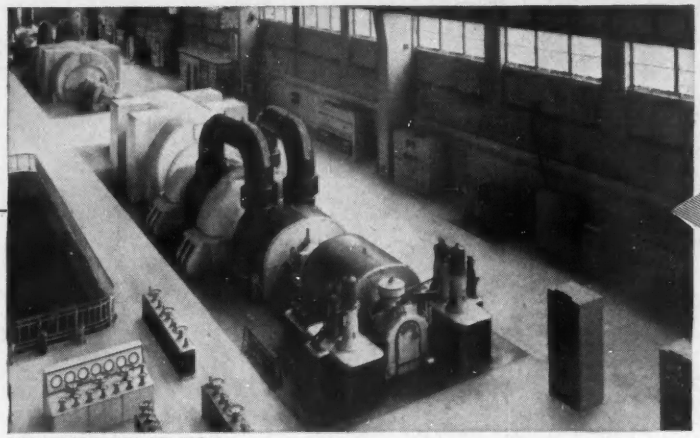
BRANCH OFFICES at BIRMINGHAM · CARDIFF · GLASGOW · MANCHESTER and NEWCASTLE-UPON-TYNE and representatives in most countries throughout the world. In CANADA, MICANITE CANADA LTD.

Manufacturers of MICANITE (Built-up Mica Insulation). Fabricated and Processed MICA. PAXOLIN Laminated Materials. PANILAX Laminated Materials and Mouldings. EMPIRE Varnished Insulating Cloths and Tapes. HIGH VOLTAGE BUSHINGS & TERMINALS. Distributors of Micoflex-Duratube Sleevings, Micoflex-Durasleeve (Plastics-covered flexible metal conduit) and Kenutuf Injection Mouldings (in most thermoplastics including P.V.C.)

Highest station efficiencies in 1953

30·4%

STOURPORT B STATION



29·1%

BROMBOROUGH STATION

From information published by the British Electricity Authority, Stourport B and Bromborough Stations recorded overall thermal efficiencies in 1953 of 30·4 per cent and 29·1 per cent respectively ● These were the highest efficiencies for stations in Britain with tandem compound generating sets operating on a straight steam cycle ● The size of the generating set at Stourport B Station is 60 MW and it is supplied with steam at 1250 lb. per square inch and 950° F ● At Bromborough the size of each set is 50 MW and the steam conditions are 900 lb. per square inch 900°F.

The steam turbine plant at each station was supplied and installed by The ENGLISH ELECTRIC Company Limited.

'ENGLISH ELECTRIC'

steam turbo-alternator sets

THE ENGLISH ELECTRIC COMPANY LIMITED, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

Steam Turbine Division, Rugby

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

STA.10G4

A

Coal cutters and conveyors are powered through electric cables. Communication cables are even more important to the miner . . . his life may depend on them. After extensive research, members of the Cable Makers Association have developed special fire-resisting cables for maximum safety in the mines.

By close collaboration among its members, the C.M.A. has pioneered the most important developments in electric cable making. That same collaboration makes possible the exceptionally high standards for all types of C.M.A. cable—and safeguards every user.

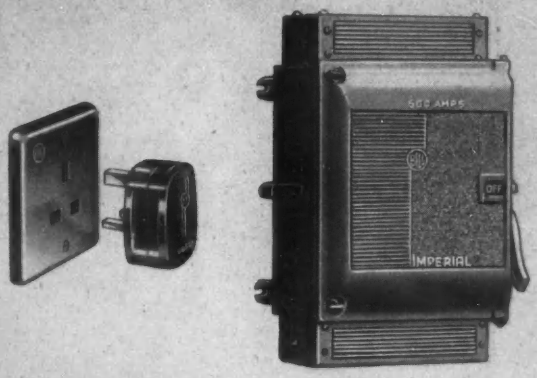
SPECIFY C·M·A CABLES

The 'Roman Warrior' and letters 'C.M.A.' are British Registered Certification Trade Marks

CABLE MAKERS ASSOCIATION, 52/54 HIGH HOLBORN, LONDON, W.C.I

BILL — YOU CANNOT BUY BETTER GEAR

You cannot buy better gear



BILL COMPLETE RANGE
13 AMP SOCKET OUTLET TO 500 AMP FUSE SWITCH

★ SOCKET OUTLETS
★ COOKER SWITCHES
★ DISTRIBUTION BOARDS
★ SWITCHES AND SWITCH FUSES
★ INDUSTRIAL PANELS

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
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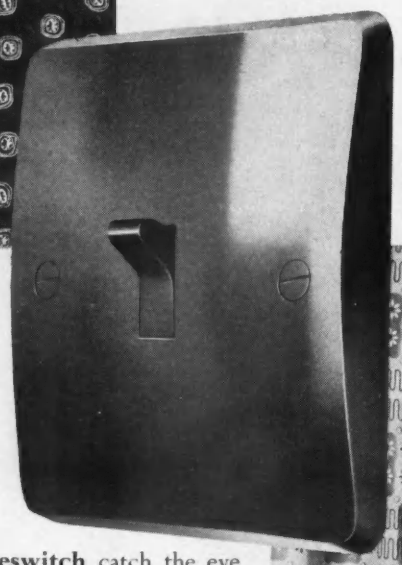
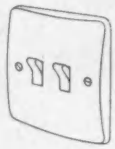
6a PETER ST.	HEAD OFFICE.	HEAD OFFICE.	LECKHAMPTON HILL	WOOD STREET.	CHURCH LANE?	2 LOVELL RD.	232 PRINCE CONSORT RD.	ST VINCENT LANE

MK98DHB

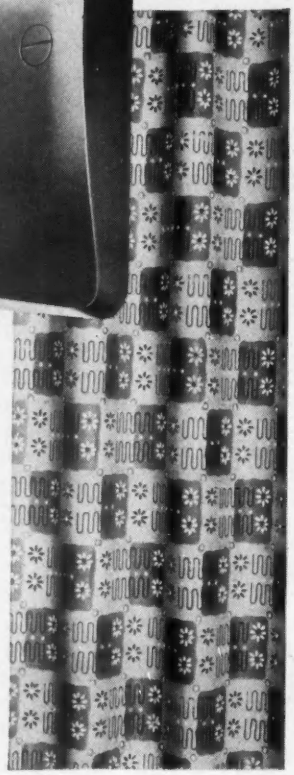
the **Plateswitch** *A distinctive new development in switch design*



the Plateswitch fits into the background of modern decoration



the compact 2-gang unit has the same dimensions as the 1-gang



The clean modern lines of the new **MK Plateswitch** catch the eye immediately. Here is a design that speaks discreetly of quality. Look at it again, and every detail of its construction and finish confirms the first impression.

Easy installation, with generous, well placed terminals; B.S. 1299 fixing centres on both one and two gang patterns; automatic levelling with the plaster; smooth, silently-controlled performance—these features combine to make the **Plateswitch** as attractive as its appearance suggests. Here, too, is a distinct price appeal. The **Plateswitch** qualifies on cost for the most competitive work. Ask for Leaflet 227 and compare the value.

THESE ADVANTAGES SIMPLIFY STOCKING

Every **Plateswitch** is supplied with four screws to match—two 4BA for metal boxes and two No. 5 wood screws for wood boxes.

The two gang **Plateswitch** has two 2-way switches only, each or both of which can be wired as 1-way.

MK REGD *. . . the mark of leadership*

M. K. Electric Limited, Wakefield Street, Edmonton, London N.18. Edmonton 5151

Produced in response to a demand for a high sensitivity version of the world-famous Universal AvoMeter, this model incorporates the traditional design features of its predecessors, so highly valued for simplicity of operation and compact portability.

It has a sensitivity of 20,000 ohms per volt on all D.C. voltage ranges and 1,000 ohms per volt on A.C. ranges from 100 V upwards. A decibel scale is provided for audio frequency tests. In addition, a press button has been incorporated which reverses the direction of current through the moving coil, and thus obviates the inconvenience of changing over test leads when the current direction reverses. It also simplifies the testing of potentials, both positive and negative, about a common reference point. A wide range of resistance measurements can be made using internal batteries, separate zero adjustment being provided for each range.

It is of importance to note that this model incorporates the "AVO" automatic cut-out for protection against inadvertent overloads.

Size 8¼" x 7⅛" x 4½"
Weight 6½lbs. (including leads)

£23 : 10s.

For your Valve Characteristic Meter or Valve Tester

Owing to the very large number of valves which have been issued within the last two years, no further amendments will be issued for the original "AVO" Valve Testing Manual. A new, completely revised and fully up-to-date Valve Data Manual is now available from the Company at 15/- post free.

D.C. VOLTAGE	D.C. CURRENT	A.C. VOLTAGE	A.C. CURRENT	RESISTANCE
2·5V.	50μA.	2·5V.	100mA.	*First indication* 0·5Ω.
10V.	250μA.	10V.	1A.	*Maximum indication* 20MΩ.
25V.	1mA.	25V.	2·5A.	0—2,000Ω { using internal batteries.
100V.	10mA.	100V.	10A.	0—200,000Ω { using internal batteries.
250V.	100mA.	250V.	—	0—20MΩ { using internal batteries.
1,000V.	1A.	1,000V.	—	0—200MΩ { using external batteries.
2,500V.	10A.	2,500V.	—	

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
WINDER HOUSE • DOUGLAS STREET • LONDON S.W.1 *Telephone* VICtoria 3404—9

SETTLE for NETTLE

The new NETTLE range of Weather-proof Rubber-clad Couplers, Sockets and Plugs is fully described in a new leaflet now available. A few typical items from this range are shown below. Write today for full details.

Ref. No. CP 31 Watertight Rubber Cable Coupler 2 Amp. 3 Pin.

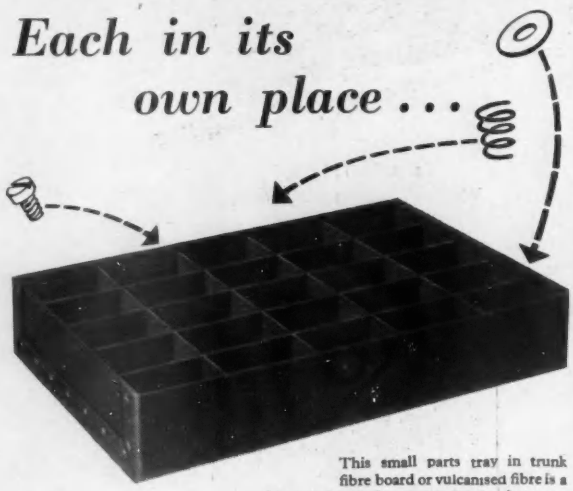
Ref. No. A 133 Weatherproof 3-way Rubber Socket Adaptor 5 Amp. and 2 Amp.

Ref. No. P 32 and SP 32 Weather-proof Batten Socket and Plug Top Side Entry, 2 Amp. 3 Pin.

★ *Also available, the comprehensive Nettle Catalogue containing details of the full range of* **NETTLE** *Shockproof Electrical Accessories. You are invited to write for a copy.*

NETTLE ACCESSORIES LTD.
HARPER ROAD · WYTHENSHAWE · MANCHESTER

Each in its own place . . .



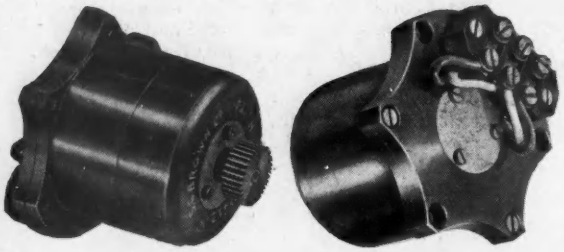
This small parts tray in trunk fibre board or vulcanised fibre is a boon to electrical component manufacturers. It can be obtained with fixed or removable partitions to hold variable amounts of small parts. Moreover, where female labour is used the lightness of fibre board for lifting and carrying will be appreciated by its users. The Enfield small parts tray is guaranteed to cut fatigue and muddle—this must result in a definite upward trend in production.

Fibre Board is STRONGER and LIGHTER

ENFIELD BOX COMPANY LIMITED

Queensway Enfield Middlesex Phone: Howard 1888 (2 lines)

SMALL
PRECISION MOTORS
FOR SPECIALISED APPLICATIONS



S. G. Brown Ltd

OFFER A RANGE OF 10 SMALL MOTORS OPERATING AT VARIOUS VOLTAGES

UNIQUE DESIGN
EXCEPTIONAL PERFORMANCE
HIGH GRADE FINISH

AS SUPPLIED TO THE BRITISH ADMIRALTY AND OTHER GOVERNMENT DEPARTMENTS

For full Details and Technical Specifications write

S. G. BROWN LTD.
SHAKESPEARE STREET, WATFORD, HERTS
TEL.: WATFORD 7241

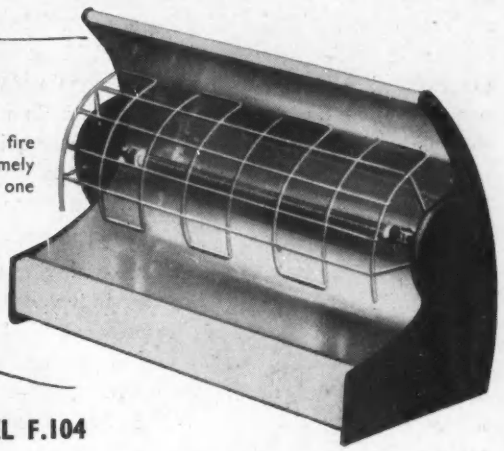
Three Fires by BNE

£7·17·1

MODEL F.103

A very good quality fire with an extremely efficient reflector. It is handsomely finished in black and ivory enamel, and has a switch to control one of its two rod type elements.

Dimensions : 16″ high ; 18¾″ wide ; 11½″ deep.
Loading : 2 kW. Price includes P.T.

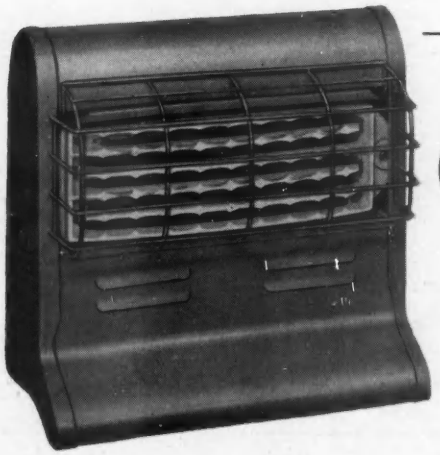


£3·8·4

A robust single-rod type reflector fire with a hard-wearing ivory and chocolate enamel finish.

Dimensions : 11¼″ high ; 16⅛″ wide ; 7⅛″ deep.
Loading : 1 kW. Price includes P.T.

MODEL F.104



£2·14·8

MODEL F.101

A sturdy general purpose fire of pressed steel construction, finished in florentine bronze.
Dimensions : 10½″ high ; 11″ wide ; 6¾″ deep.
Loading : 1 kW. Price includes P.T.
MODEL F.102 as above but 2 kW. **£3·18·7**

BRITISH NATIONAL ELECTRICS LTD.

Domestic Appliance Section of JOHNSON & PHILLIPS LTD.

NEWARTHILL · MOTHERWELL · SCOTLAND

A C to D C

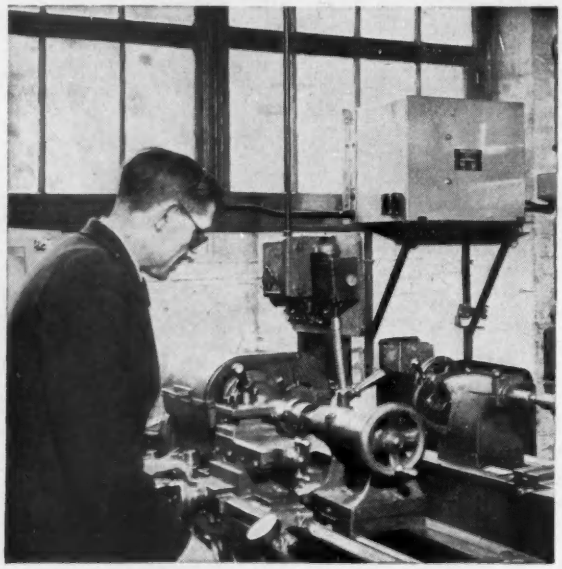
DOUBLE-VOLTAGE RECTIFIERS

INDUSTRIAL POWER SUPPLIES

CONVERSION

WESTALITE double-voltage transformer/rectifier equipments have solved many problems for electrical engineers concerned with DC/AC changeover. Merely by connecting the A.C. mains to WESTALITE rectifiers of the required output, all existing D.C. equipment will operate as usual without further adjustments. Completely static in operation, WESTALITE rectifiers require no maintenance or renewals, and these factors, coupled with their extremely high efficiency, effect the utmost economy.

The illustration shows a WESTALITE double-voltage rectifier supplying power to a D.C. motor driving a lathe in one of the many machine shops etc. in the South East area of London that have recently changed over from D.C. to A.C. mains. Any similar problems can be dealt with efficiently from an extensive range of either single- or three-phase WESTALITE double-voltage equipments.



WESTALITE

METAL RECTIFIERS

Full details are contained in Data Sheet No. 802 available from the address below

Dept E.T.14

WESTINGHOUSE BRAKE & SIGNAL CO. LTD. 82 York Way, King's Cross, London, N.1

VYBAK insulation for length*-and life

**This armoured signalling cable recently installed at the Bradford Colliery, Lancs. was made in a single length of 1,800 ft.* by the Mersey Cable Works Limited. The cable consists of 36 pairs of double-wires, each insulated with VYBAK covering in various colours and the whole enclosed in black VYBAK sheathing.

VYBAK Flexible Extrusion Compounds are tough and hard-wearing, with good resistance to fire, abrasion, weathering and most chemicals. A choice is available from a wide range of colours for electrical colour codes or decorative purposes.

Comprehensive data sheets for all grades are available on request.

BAKELITE LIMITED

12-18 Grosvenor Gardens, London SW1 Telephone: SLOane 0898.

Vybak Products Include: Rigid and flexible PVC compounds for moulding and extrusion; calendered sheet; rigid and flexible pressed sheet—coloured, transparent or translucent; heavy grade industrial rigid sheet; Polymer and Copolymer resins.

VYBAK REGD.

Compounds

C4

B

A Range of Fuse Switches of

Advanced Design
Outstanding Performance
Competitively Priced

The **"SANDACLAD"**

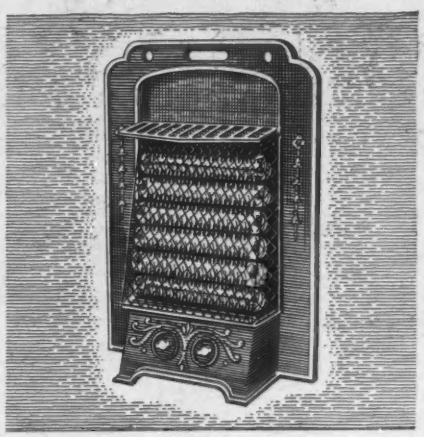
Developed and Manufactured exclusively by

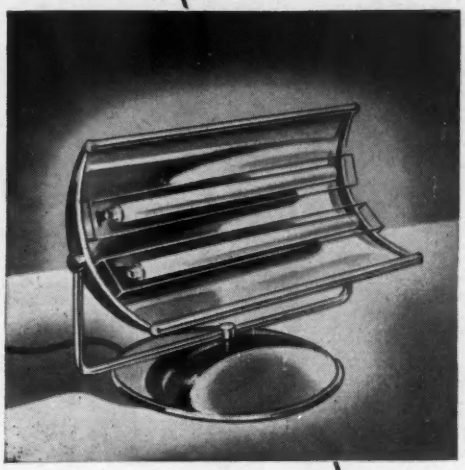
Write now for fully descriptive twelve page booklet
REFERENCE 151

SANDERS
WEDNESBURY

WM. SANDERS & CO. (WEDNESBURY) LTD., WEDNESBURY, STAFFS.

Progress in design





Since the early days of domestic electrical heating a great deal of research has been done. The result : the Brightray series of nickel-chromium resistance materials — outstandingly reliable, and with special grades to suit all domestic and industrial applications. Let us help you select the one most suitable for *your* requirements.

BRIGHTRAY C for intermittent heating and cooling cycles up to 1150°C: particularly suitable for fires, irons, cookers, heating plates, etc.

BRIGHTRAY S for electric furnace elements working almost continuously at temperatures up to 1150°C.

BRIGHTRAY B for all types of element where temperature does not exceed 950°C.

BRIGHTRAY F for furnace elements operating in a carburising atmosphere not above 1000°C.

WOULD YOU LIKE A HANDBOOK . . .

containing complete data on our electrical resistance materials? We will gladly send it free of charge on hearing from you on your business letterhead.

BRIGHTRAY reliable HEATING ELEMENTS

'Brightray' is a registered trademark.

HENRY WIGGIN AND COMPANY LIMITED · WIGGIN STREET · BIRMINGHAM · 16

36/BR/46

Resolve the problem

relating to

the best type of

insulated wire

for a specific application

by consulting

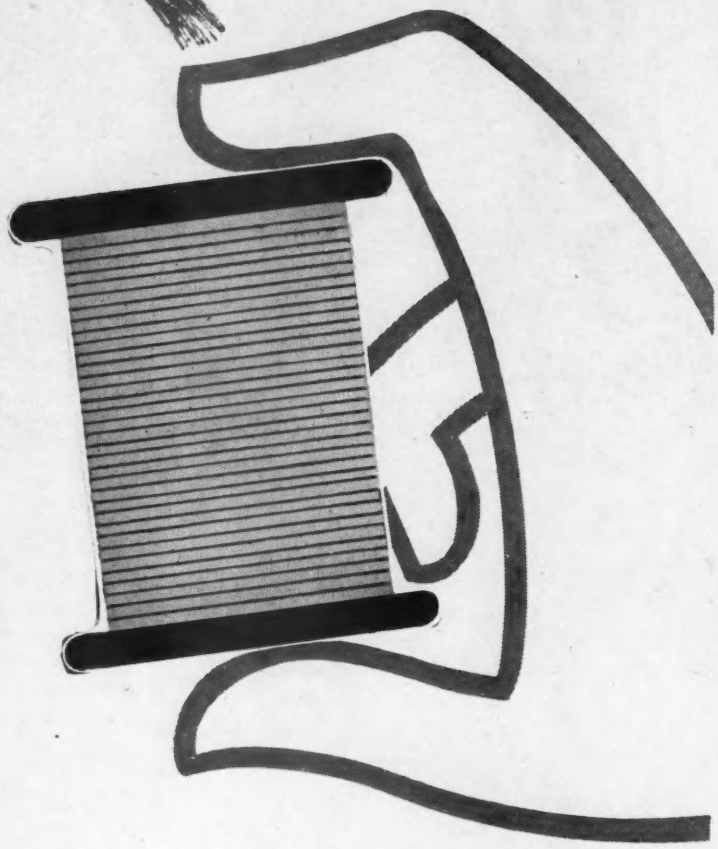
THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED LEW LEYTON

whose many branches

and technical

service are waiting

to help.



Write for pamphlets giving technical information and data

LEWCOS REGD.

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED

LEYTON, LONDON, E.10.

INCORPORATING FREDERICK SMITH AND COMPANY

ASSOCIATED WITH THE LIVERPOOL ELECTRIC CABLE COMPANY LTD., AND VACTITE WIRE COMPANY LTD.

VERSCO

wash boilers
new editions of a famous range

VERSCO SQUARE BOILER

VERSCO ROUND BOILER

VERSCO SQUARE DE LUXE BOILER. This smart and compact boiler is fitted with castors for easy movement and is finished in cream stove enamel. The table-top in cream vitreous is an attractive feature.

VERSCO ROUND BOILER. Obtainable in Galvanised finish as shown (a most durable finish of special appeal for Corporation and other housing schemes) or in cream stove enamel.

THESE FEATURES ARE COMMON TO ALL VERSCO MODELS: Heavily tinned 10 GALLON copper container —Double pole 3 heat rotary switches A.C. or D.C. (safety cut-out available if required)—Chromium plated taps with heat-resisting handles—Six 500 W clamp-on elements give maximum loading of 3 Kw.—Top surrounds in die-cast aluminium and pressed aluminium loose lids for easy access.

Send for new leaflet giving full specifications and prices.

SWIRLUX

WASHING MACHINES

500H MODEL heats the water, 6 lb. dry weight capacity, 12" wringer which folds down when not in use. Exclusive Swirlux agitator. (Unheated version 500 MODEL also available.) 503 MODEL— 10/11 lb. dry weight capacity, full size power wringer with five working positions. Exclusive Swirlux agitator. Power pump and hose for quick emptying. For full details send for Swirlux Leaflets.

Universal Boilers & Engineering Co. Ltd., Fulledge Works, Burnley, Lancs.
TELEPHONE: 3121 and 3203

Cables by EDISWAN

To facilitate increased production of beet sugar at the Kidderminster and Poppleton factories of the British Sugar Corporation Ltd., a complete re-planning of the L.T. power and lighting distribution schemes was recently undertaken. This work, involving the erection and jointing of some 4,000 yards of Ediswan paper-insulated mains cable in each factory, was designed and carried out by the Cable Contracts Department of The Edison Swan Electric Co. Ltd., in association with the Corporation's engineers.

THE EDISON SWAN ELECTRIC COMPANY LTD., 155 Charing Cross Rd., London, W.C.2

Member of the A.E.I. Group of Companies

C.83

Write for leaflet G13015

B
T-H

BRITISH

STANDARD DIMENSION MOTORS

AVAILABLE FROM STOCK

British Thomson-Houston were among the first to manufacture mechanically-interchangeable motors conforming to B.S.2083. Other makers build to this spec., but the BTH range of totally-enclosed fan-cooled squirrel-cage motors up to 20 h.p. have mechanical and electrical characteristics that are unsurpassed.

THE **BRITISH THOMSON-HOUSTON** CO. LTD. · RUGBY · ENGLAND

Member of the AEI group of companies

A4809

15% MORE LIGHT
NOW AVAILABLE
from
Osram
"NATURAL"
Fluorescent Tubes

Description	Average Light Output during first 5,000 hours of life (lumens)	
	OLD	**NEW**
5ft 80w	2,720	**3,120**
4ft 40w	1,520	**1,640**

No other fluorescent tube gives more light or lasts longer than

Osram

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Why do they choose

'BICALEX' WINDING WIRES?

ANY OF THE LEADING MANUFACTURERS OF ELECTRIC MOTORS USE 'BICALEX' WIRES

'Bicalex' Winding Wires give you all the well-recognized advantages of standard enamel winding wires, plus special advantages of their own. Some of these are listed on the right.

If you have any of the following jobs on hand you will find these wires of particular interest.

- High-speed winding and applications where the fitting of preformed coils involves the possibility of mechanical damage.
- Windings where space is limited or coil size must be a minimum.
- Windings which are to be impregnated with quick-drying synthetic varnishes of high bonding strength.
- Dry unimpregnated windings which may be subject to high humidity.

The dielectric strength of 'Bicalex' Winding Wires fully satisfies the requirements of B.S.1844. For fuller information write for Publication No. 322.

Brook Motors Ltd., Huddersfield, use large quantities of 'Bicalex' Winding Wires. The illustration shows a stator being wound with 'Bicalex' coils at their factory.

BECAUSE

THEY'RE TOUGH—to withstand rough handling

High speed winding and its attendant rigours do not harm them. They can be stretched, twisted and even flattened without the insulation being damaged.

THEY'RE EXTREMELY FLEXIBLE

A wire may be wound round itself without the covering cracking. Operators like them for hand wiring jobs.

THEY RESIST NEARLY ALL VARNISH SOLVENTS

The use of 'Bicalex' Wires considerably extends the range of impregnating varnishes that may be used.

THEY WITHSTAND 110°C WITHOUT "AGEING"

Though 'Bicalex' coverings come under the category of Class "A" (organic) insulation, prolonged exposure to this temperature produces no "ageing" effect.

THEIR COVERING WILL NOT "TUBE"

The covering of 'Bicalex' Wires adheres completely to the conductor, thus guarding against damage by "plucking", or "tubing" on elongation

THEY RESIST CONTAMINATED AND HUMID ATMOSPHERES

Acid or alkaline atmospheres do not damage the insulation. Its breakdown strength is not lowered by exposure to high humidity.

BICC

WINDING WIRES

BRITISH INSULATED CALLENDER'S CABLES LIMITED
21 BLOOMSBURY STREET · LONDON · W.C.1

WOOTTON
METER BOARDS
AND SWITCH BLOCKS

We have been making and supplying the Electrical Industry with METER BOARDS and Switch Blocks for over 27 years.

- FIRST CLASS WORK
- QUICK DELIVERY
- COMPETITIVE PRICES

We invite your enquiries

WOOTTON & CO., LTD.

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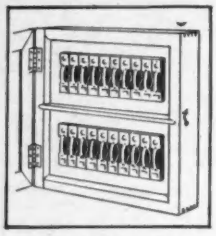
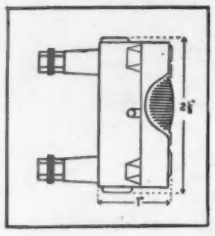
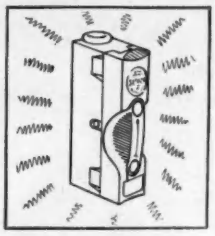


MINIMUM DIMENSIONS

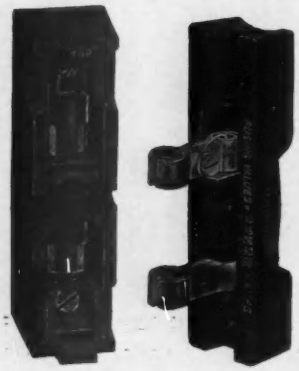


EASE OF MOUNTING AND WIRING



VIBRATION AND SHOCK PROOF

To simplify and protect . . .



Slydlok 5 amp 250 volt fuses afford the designer complete freedom because their ease of wiring, their compactness, and above all their resistance to mechanical shock, enables them to be incorporated wherever convenient. Adaptable for cartridge fuses and neutral links, Slydlok afford protection with simplicity. Write for literature.

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Tel: WYThenshawe 2235/6/7 *Grams: Slydlox, Manchester*

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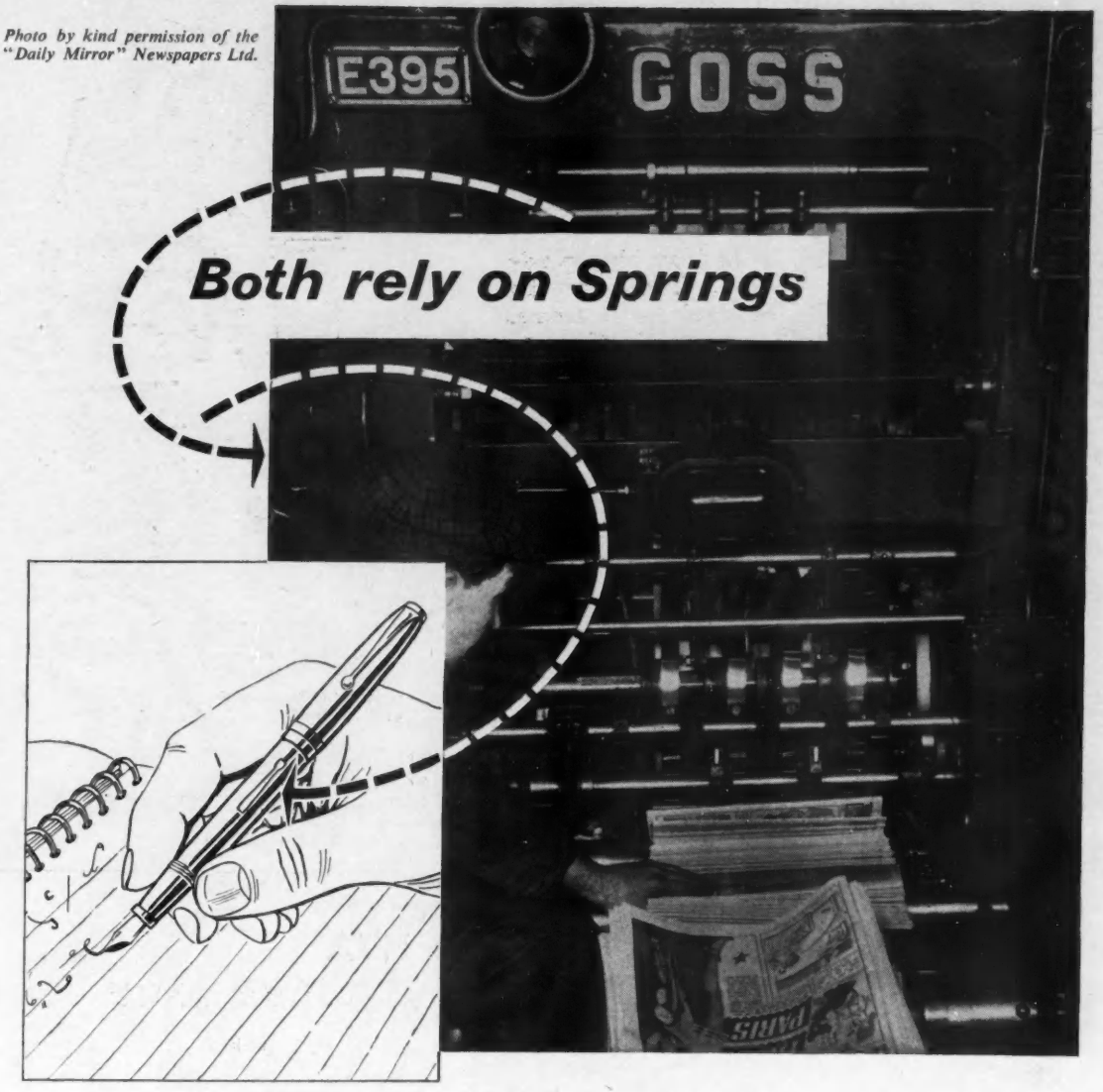

reliable Springs by

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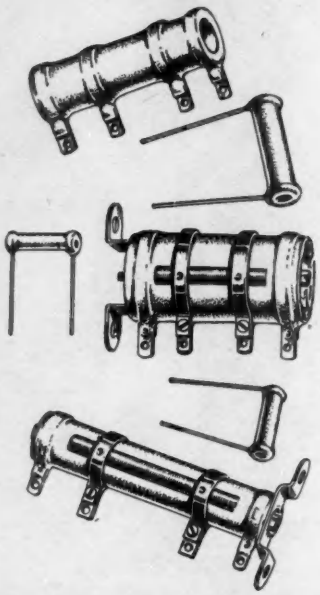

C.R.M. resistors are wound on high grade low loss ceramic tubes. They can be coated with — Silicone Resins — Vitreous enamel or Cement with terminations to suit customers requirements.
C.R.M. resistors have a low temperature Co-efficient of resistance, are of robust construction and can be used under conditions where reliability and stability are important factors.
Good delivery — Low prices.
We shall be pleased to quote for your requirements.

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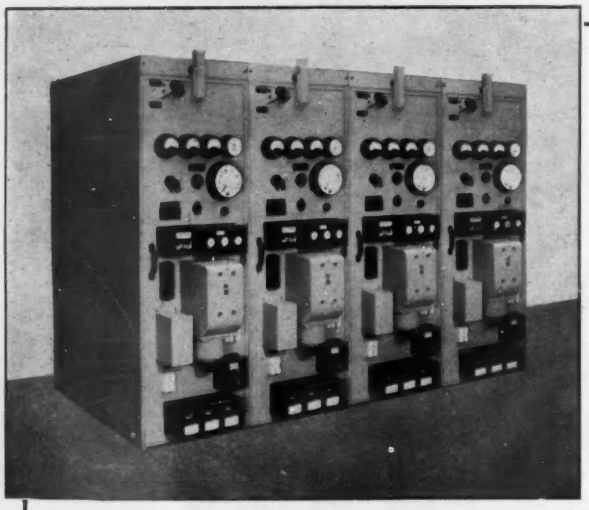
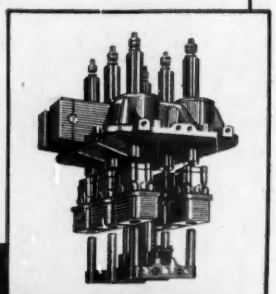


250 MVA
Switchgear
with
TYPE H. 25
oil circuit breakers
6·6 & 11kV.



The switchgear is of the air insulated truck or fixed cubicle pattern. The oil circuit-breakers are A.S.T.A. certified and may be arranged for hand, spring or solenoid operation. They can be supplied as loose units for the replacement of obsolete breakers.

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PLATE TYPE AIR HEATER

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Here is good air heater design; flexible to meet varying plant layouts and requirements; giving maximum heat transfer and substantial fuel economy.

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is ensured because there are no moving parts or intricate gas passages and therefore no mechanical maintenance.

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ensures no overloading of Forced and Induced Draught Fans.

CONSTRUCTION IS GAS-TIGHT
and hence there is no air contamination.

READY ACCESS
is provided for inspection and cleaning.

The heater is applicable to boiler installations, for raising the temperature of combustion air, or to process work, e.g. utilizing waste gases as a heating medium for raising the temperature of air or gas used in process work such as drying, ventilating or certain chemical processes.

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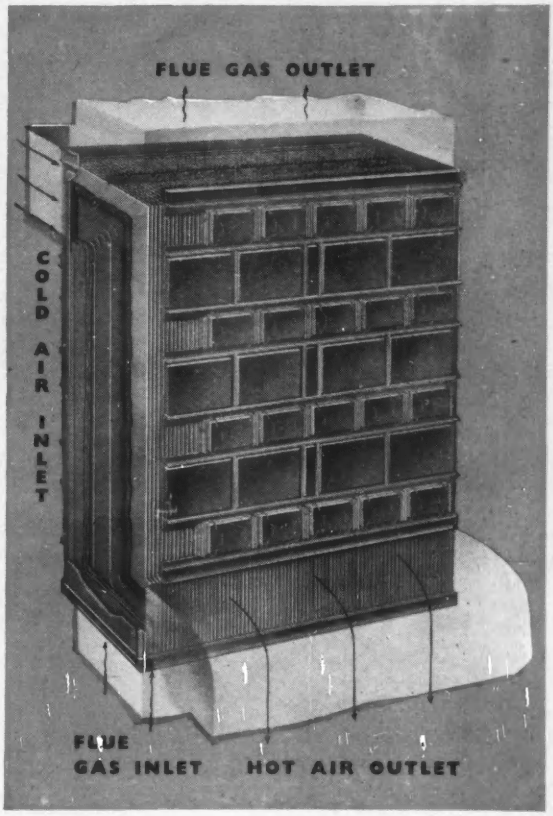

C.10

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-BUT SO

STURDY

PORTABLE

WATTMETERS for A.C. and D.C.

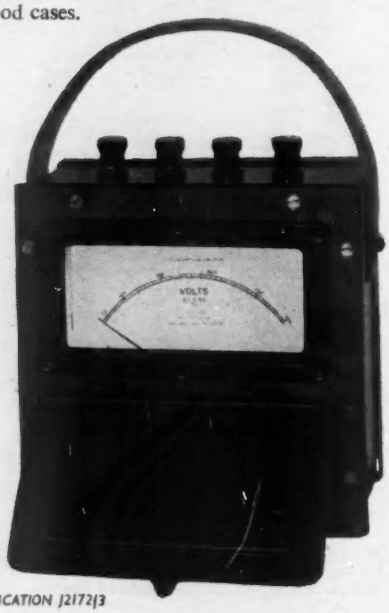
Ironless dynamometer type instruments.
Movements mounted in spring-urged jewels.
Mechanically produced clear, legible scale.
Knife-edge pointers facilitate accurate readings.
Polished wood cases.

FULL DETAILS IN PUBLICATION J226

PORTABLE

VOLTMETERS and AMMETERS for A.C. and D.C.

Movements pivoted in spring-mounted jewels.
Individually calibrated finely divided scale.
Mechanically produced clear, legible scale.
Knife-edge pointers facilitate accurate readings.
Polished wood cases.



FULL DETAILS IN PUBLICATION J2172/3

Eversheds portable instruments are widely used in industry because they combine the high standard of Eversheds accuracy with a strong construction to withstand shocks and hard usage. Full details and prices available on application.

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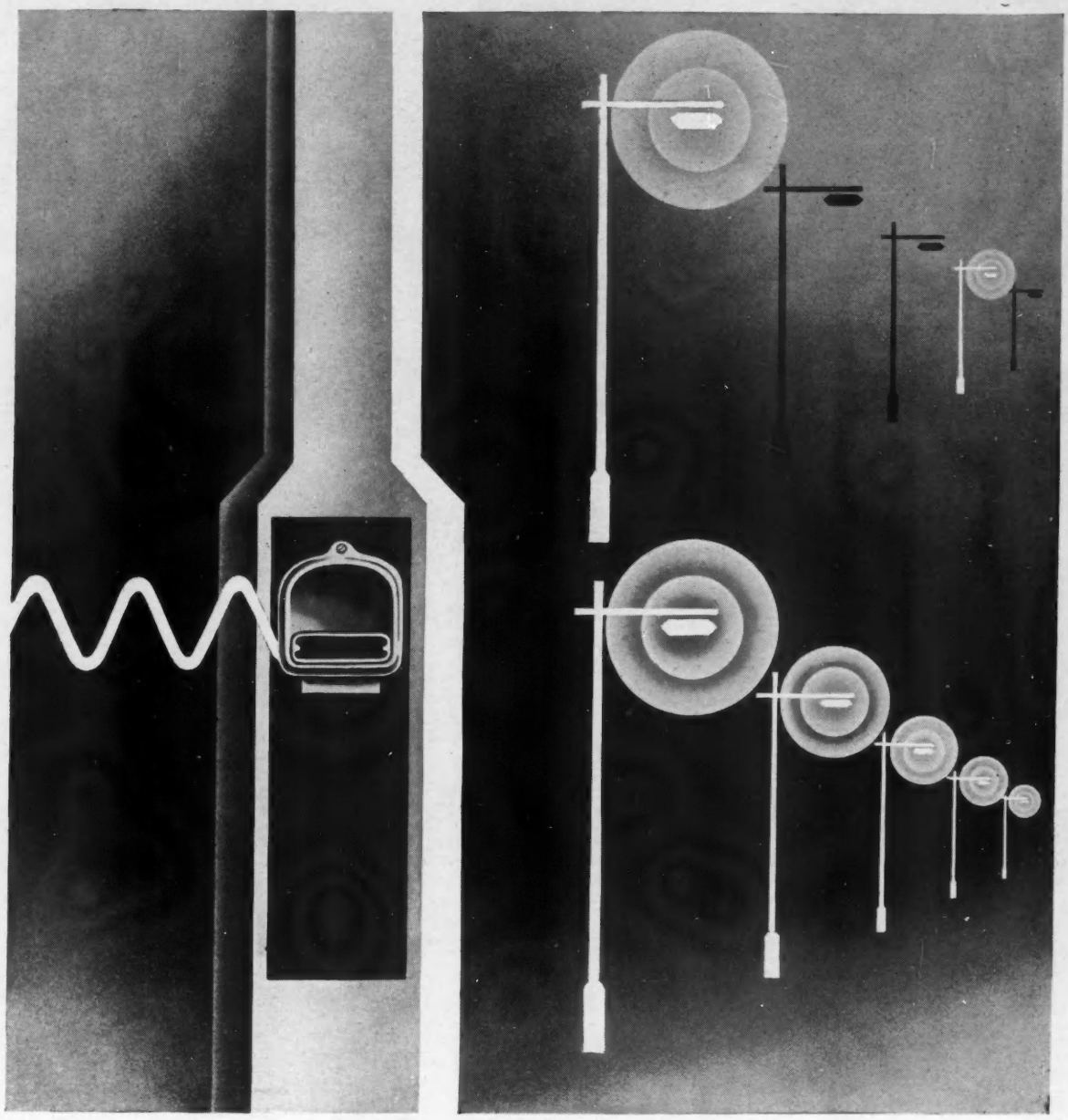

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When planning a lighting network the engineer is naturally anxious to supply the community with the finest equipment available. A control system is part of the lighting plan and for the engineer who wants a system always under his personal control, without any worries about supply interruptions, " Rythmatic " ripple control offers the following advantages:—

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★ Centralized push-button control.
★ Multiple signals for all-night, half-night, prior-dawn switching.
★ Control switches fit most housings.
★ Control switches need virtually no maintenance.
★ For the services available " Rythmatic " is the most economical form of control.
★ Signals are available at any time, day or night.

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★★ THRUST BEARINGS
★ BALL JOURNALS
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★ DOUBLE PURPOSE BEARINGS
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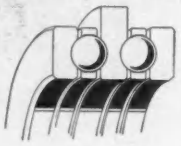
★ AIRCRAFT BEARINGS

OUR ENGINEERING DEPARTMENT WILL WELCOME THE OPPORTUNITY TO CONSIDER YOUR SPECIFIC APPLICATIONS AND MAKE RECOMMENDATIONS.

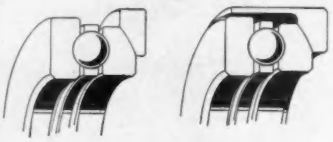
THRUST BEARINGS

In this series the balls run between washers in which suitable tracks are formed. The single row type shown above will only resist thrust in one direction.

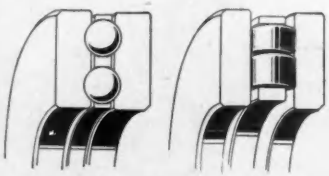


Where thrust loads are in alternate directions, Double Thrust Bearings are available.

Should the bearings be required to allow for misalignment, the washers are ground spherical and fit in a spherical seating formed either on an additional washer or in a housing.



Where loads are exceptionally heavy, thrust bearings with two rows of balls, or multiple rows of rollers, can be made to specific requirements.



RANSOME & MARLES BEARING CO., LTD., NEWARK-ON-TRENT, ENGLAND

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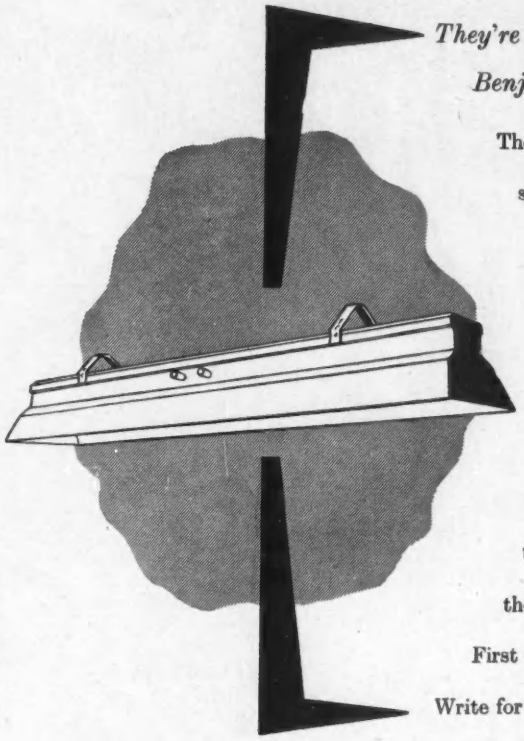
Benjamin introduce

PEROPAL REGD

a *NEW* finish for a *NEW* range of FLUROLIER fittings Regd.



They're here for immediate delivery! — the new Benjamin fittings!

They provide an additional line of economical Reflectors specially developed by Benjamin for light industrial requirements. A result of intensive research, 'PEROPAL' finish is undoubtedly the finest of its kind now available.

These Benjamin fittings are 'PEROPAL' finished white inside and out and are manufactured in the normal Flurolier types. They have the same channels, gear, twin tube circuits and installation facilities — only the reflectors are different.

First class lighting deserves first class advice.

Write for details and descriptive literature.

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HEAYBERD Transformers are designed to give the utmost reliability and economy in operation, fully in accordance with the relevant British Standard Specifications.
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Also C.S.A. Approved Transformers.

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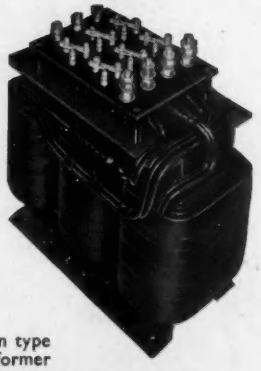
A 250 VA Power Transformer enclosed in a wall mounting case



A typical open type 3-phase transformer

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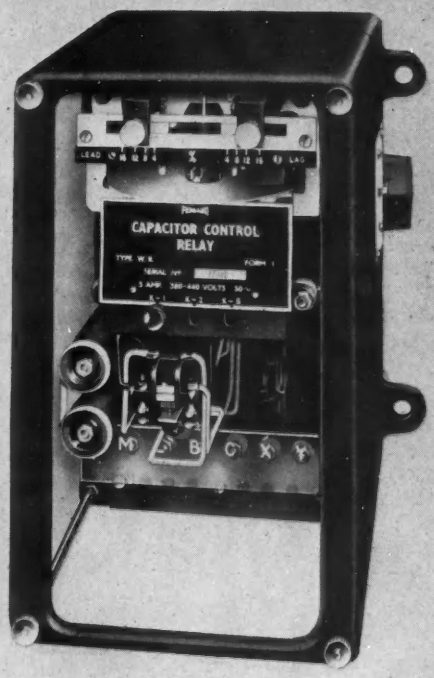
FERRANTI

CAPACITOR CONTROL RELAY

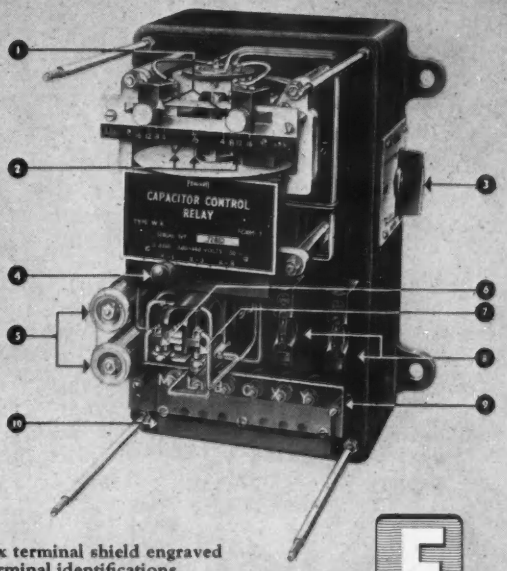
(TYPE WR)

FOR SINGLE STAGE CONTROL



This relay provides *automatic power factor correction* when used with suitable capacitors.

- Independently adjustable "lead" and "lag" settings over a wide range.
- Self-contained auxiliary element with substantial contacts to operate the heavy duty capacitor contactor.
- Selector switch to give automatic or manual control as required.



1. Independently adjustable settings for "lead" and "lag".
2. Contacts operated by movement of disc.
3. Switch for auto/manual control.
4. Settings multiplier change plug.
5. Limiting resistors in series with auxiliary relay coil.
6. Auxiliary Relay—main contacts for capacitor control.
7. Auxiliary Relay—"Hold-on" contacts.
8. Fuses.
9. Perspex terminal shield engraved with terminal identifications.
10. Dust-tight entries for wiring to terminals.

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ELECTRIC CLOCKS · ALWAYS RIGHT ON TIME

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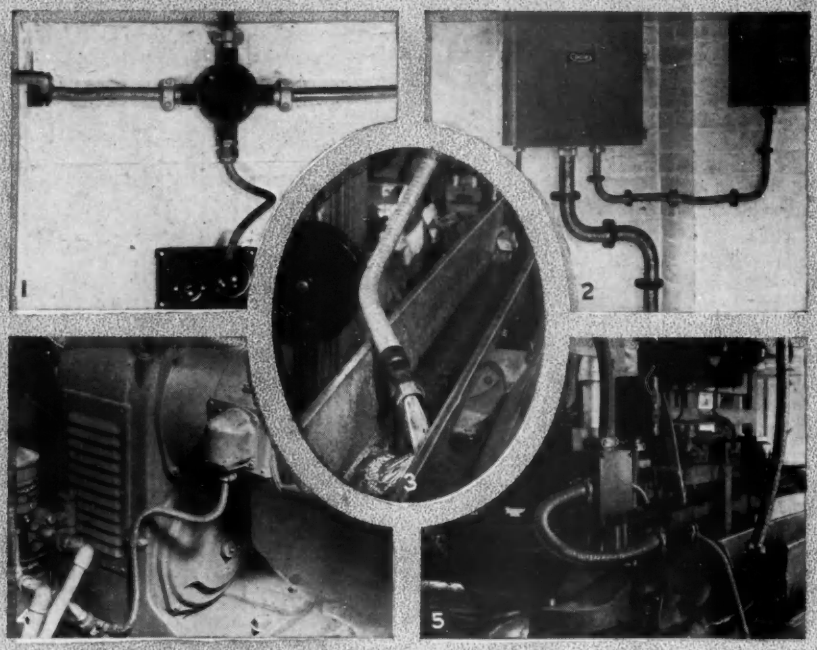

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2. Mains cable power connections in CORRUSTEEL.
3. Outstanding proof of claim that our CORRUSTEEL is completely watertight, showing cross-section of flex feed pipe on Extruding Machine using CORRUSTEEL Tube, for water-feed at mains pressure of 500 lb. per square inch.
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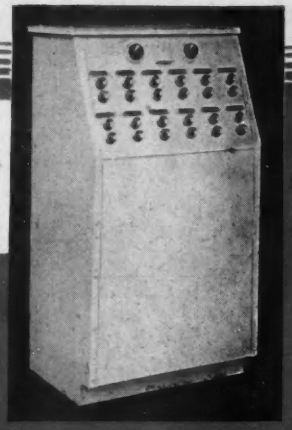
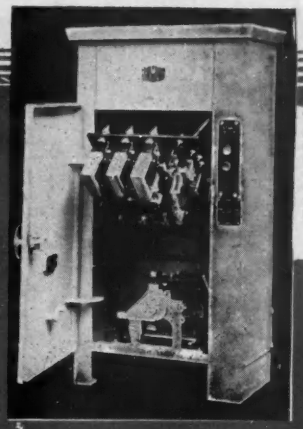


Remote Control Desk for group motor starting with indicator lamps.

A variety of arrangements is available to suit individual requirements.

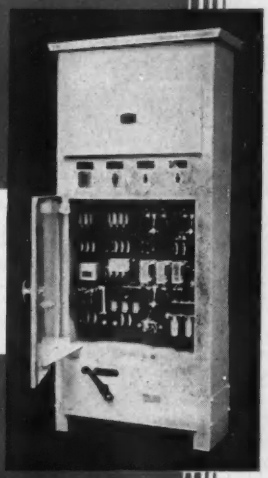


Type DO.75 Single Pillar motor starter showing accessibility of interior (isolator shield removed).

Fitted with local push-buttons and "Local Remote" rotary selector switch.

Type M.150 Contactor Unit suitable for direct mounting on Capacitor tank for power factor correction.

Pillar-type motor starter incorporating three direct-on starters and one stator rotor starter arranged for automatic sequence control and fitted with isolating switch.

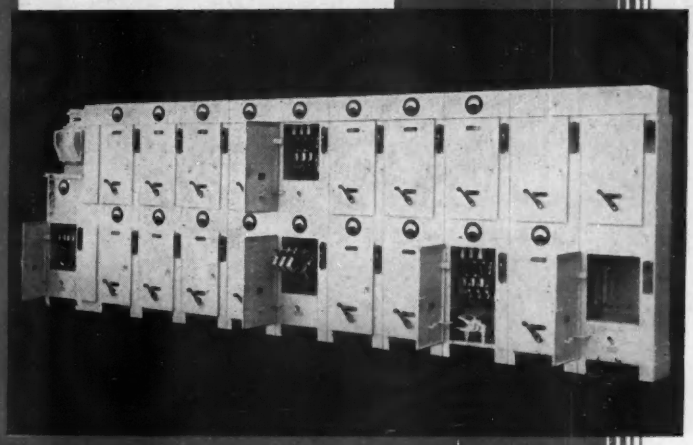


22 Unit Double Tier motor control switchboard comprising 300 amp. incoming switch and fuse unit, and contactors catering for various duties up to 100 H.P.

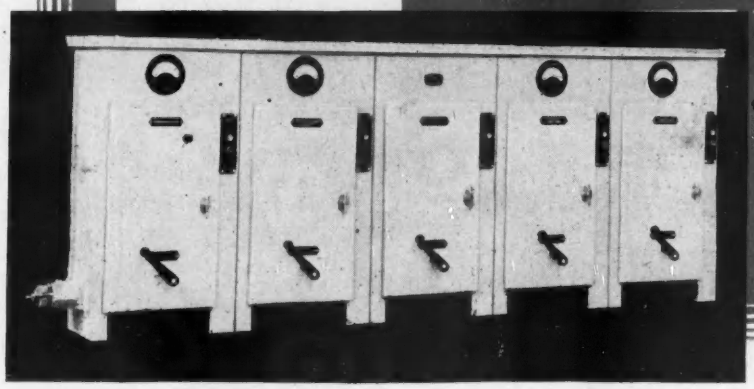
AIR BREAK ELECTRIC MOTOR CONTROL GEAR

FOR INDUSTRIAL APPLICATION

(up to 650 volts A.C.)



Single Tier motor control switchboard with individual isolation, ammeters and arranged for local push-button control.



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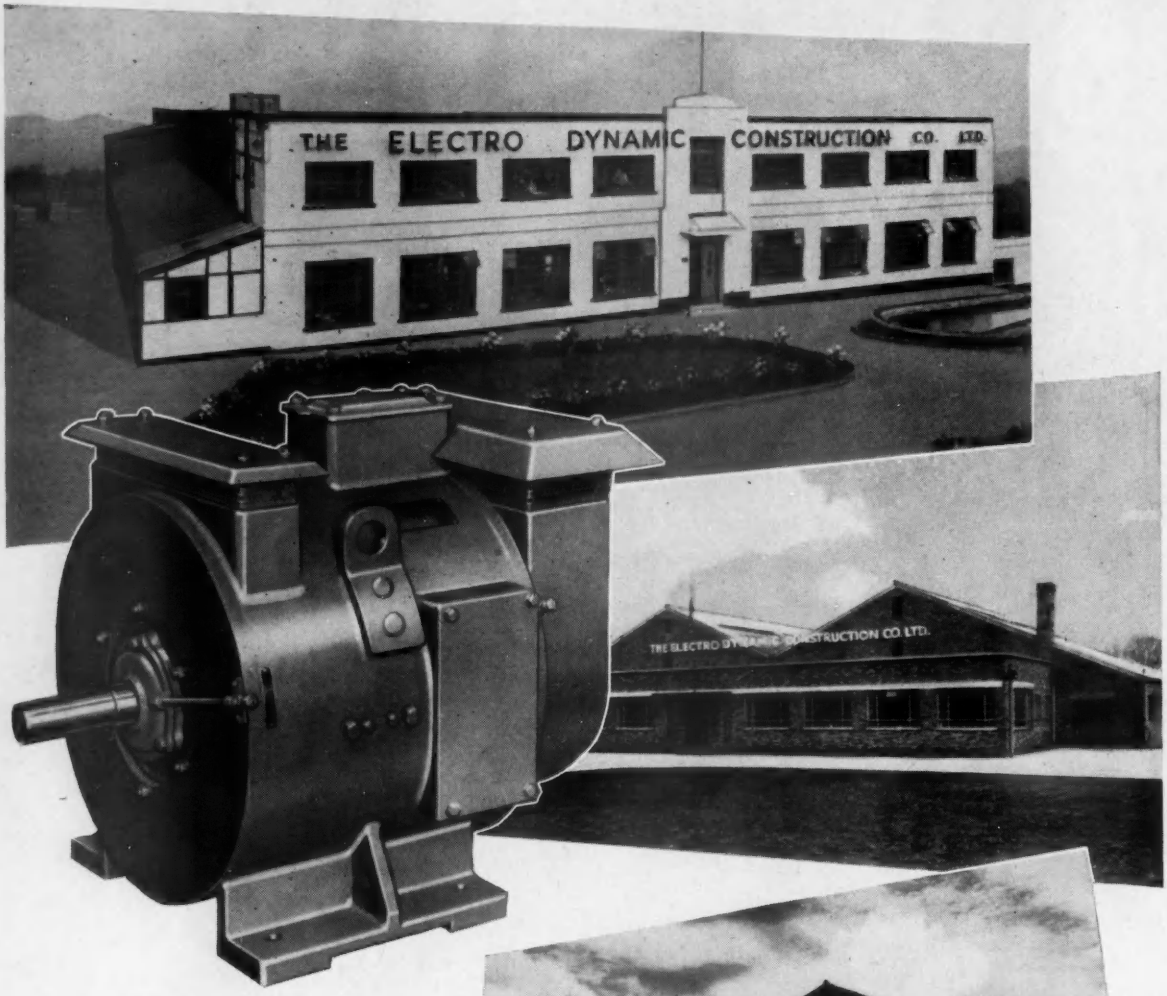

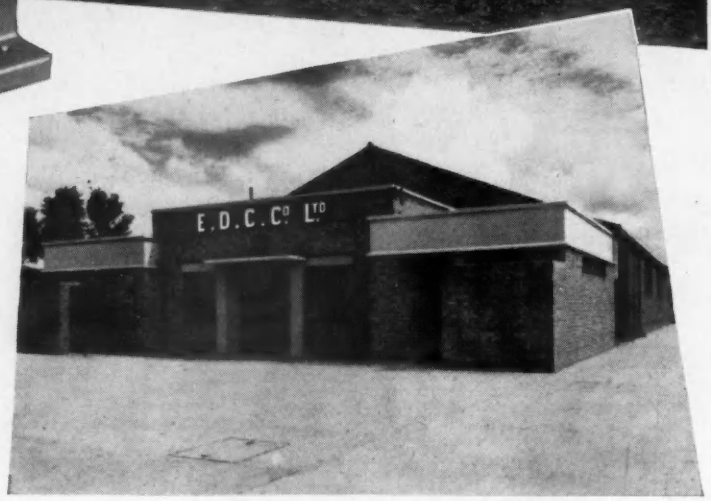

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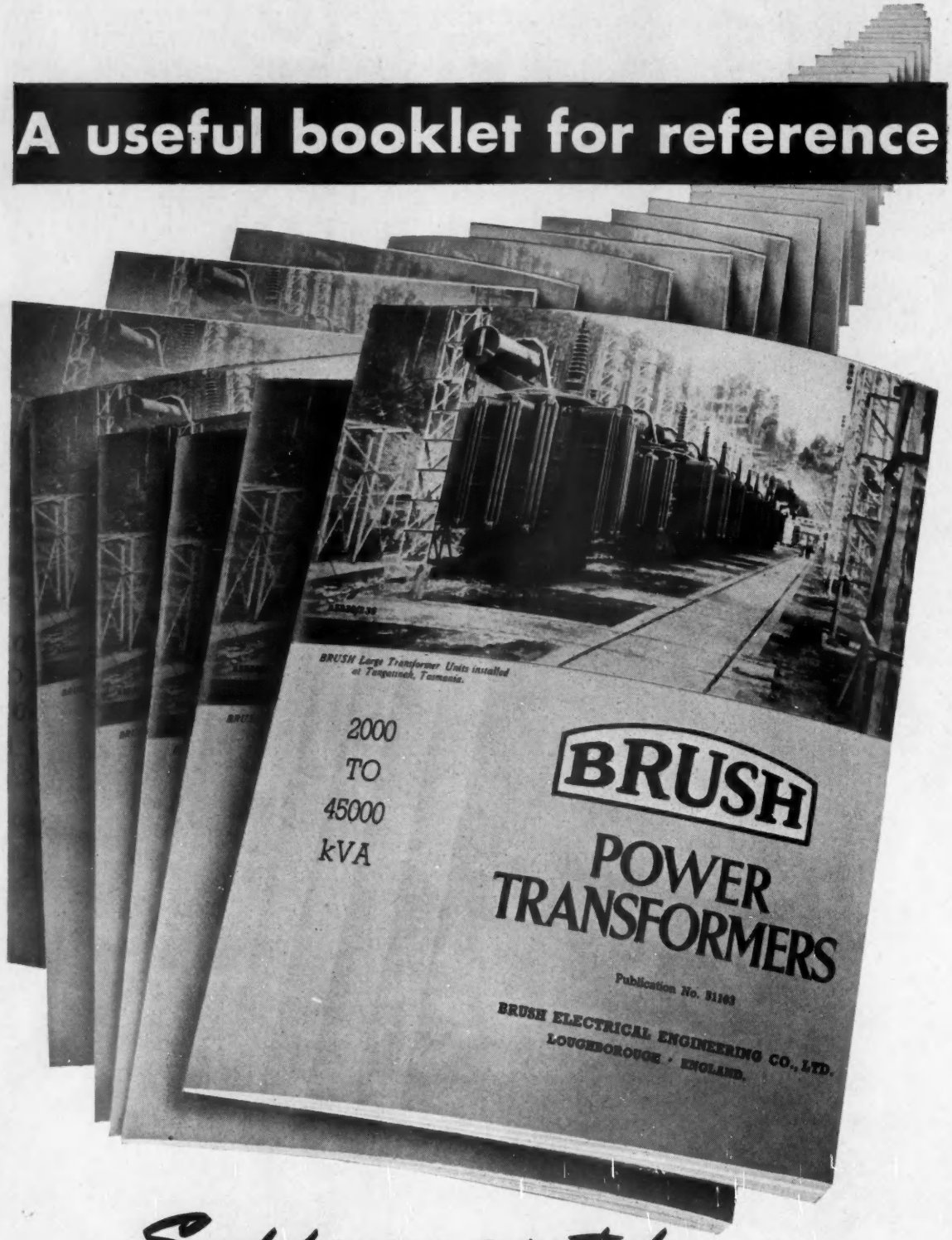
A useful booklet for reference



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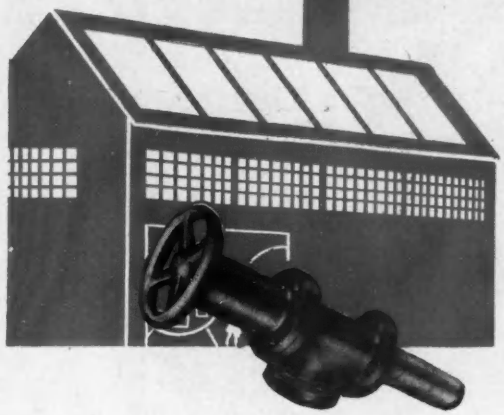

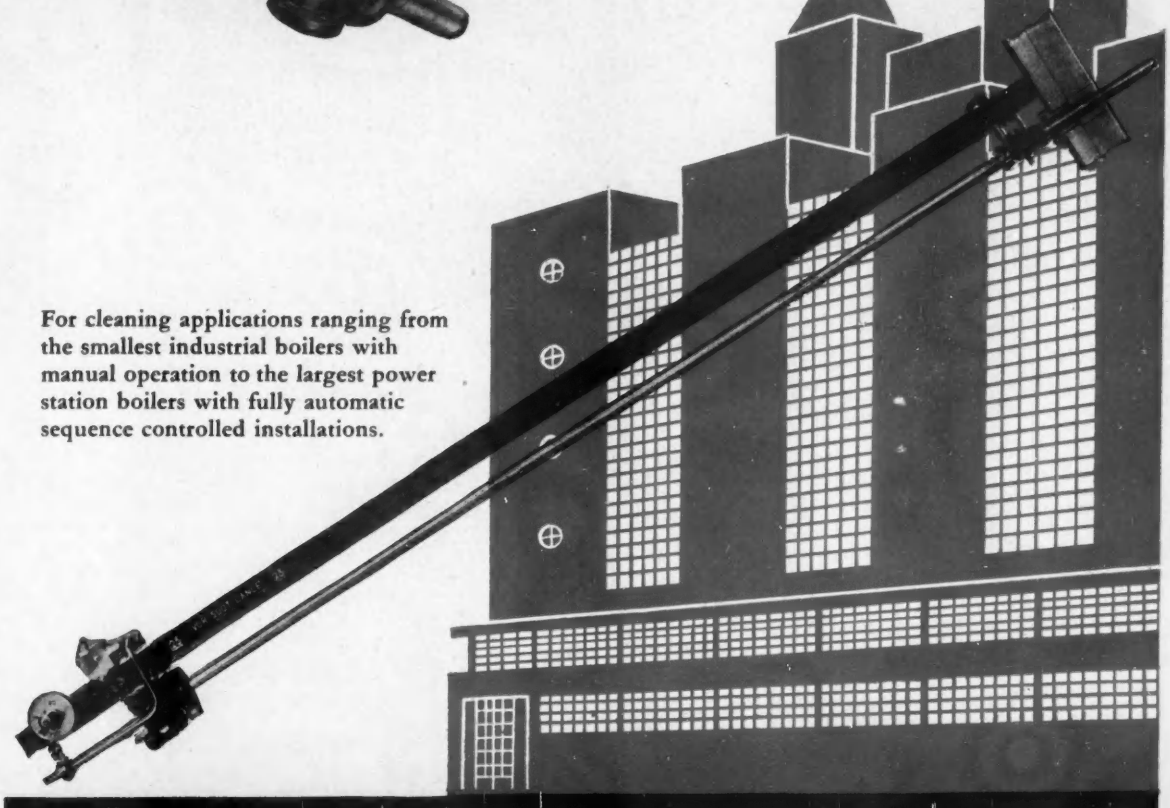

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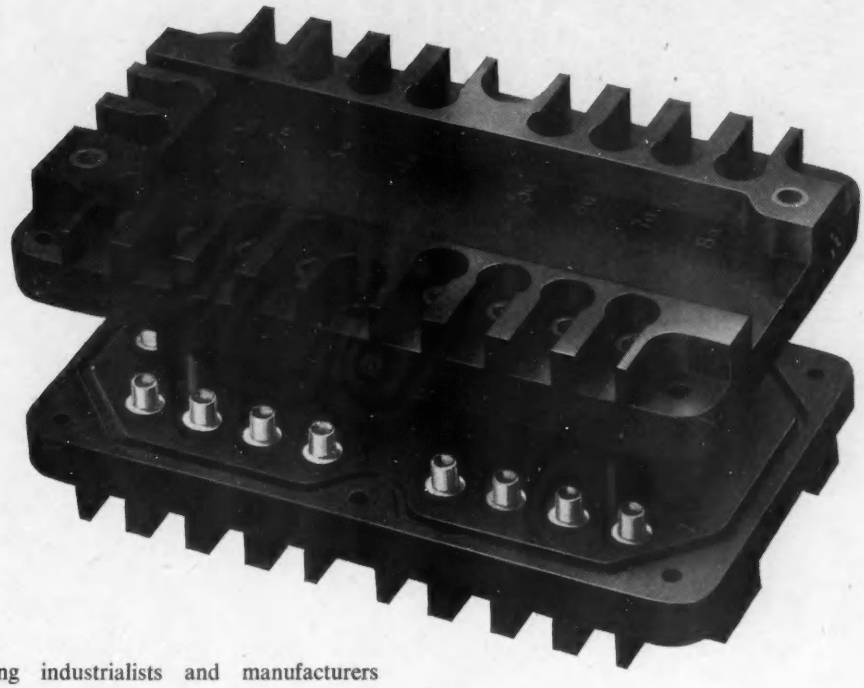

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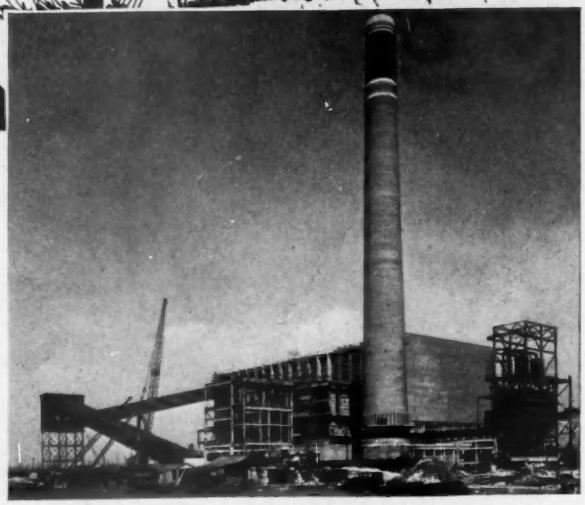

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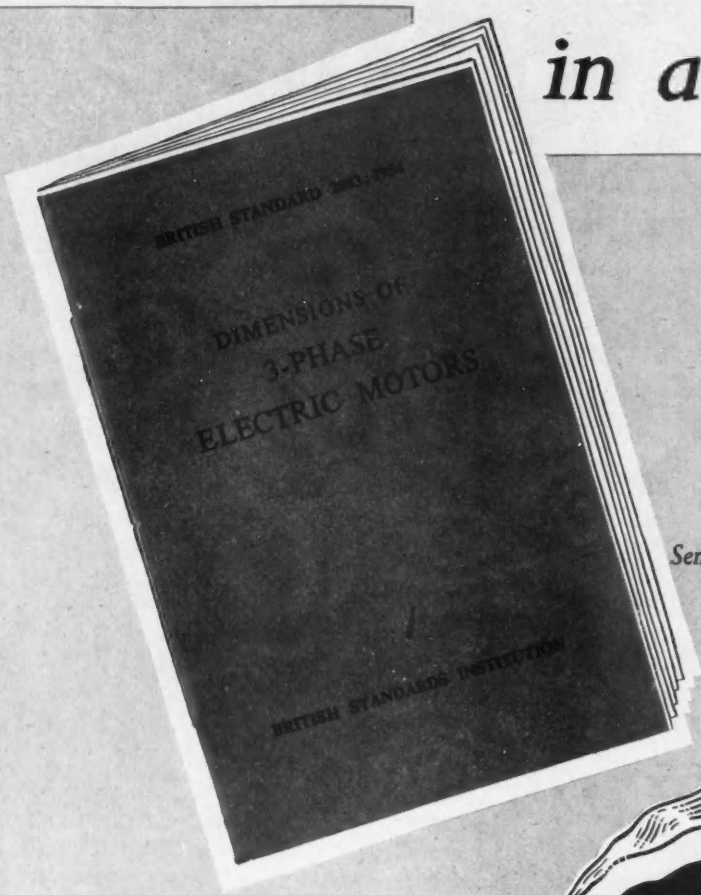

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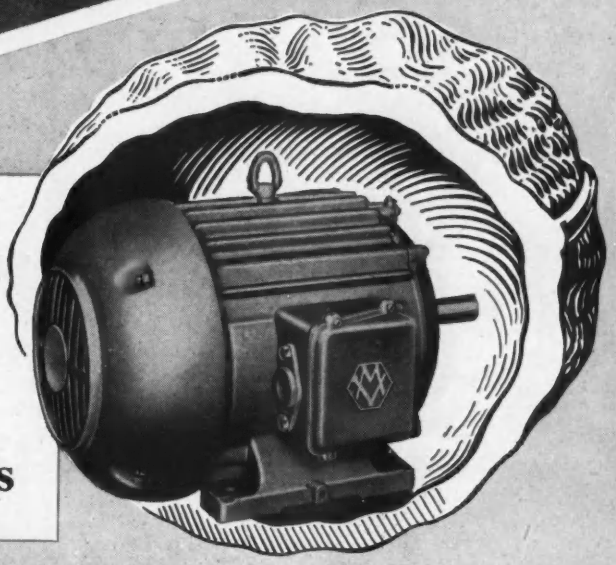

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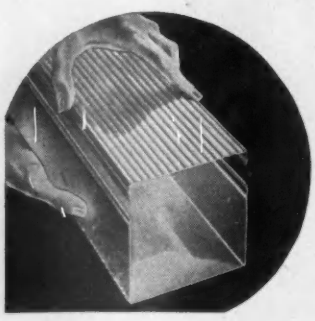

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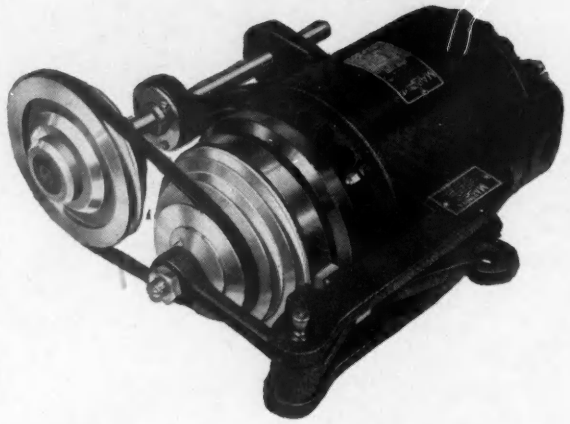

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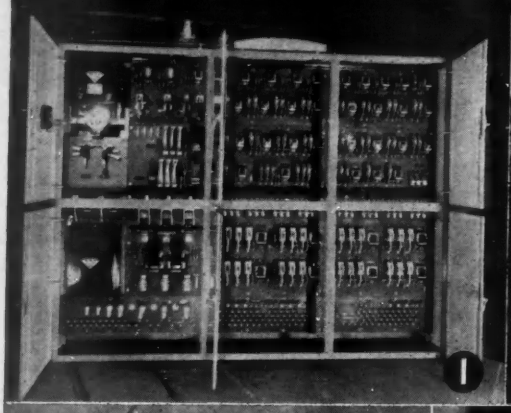

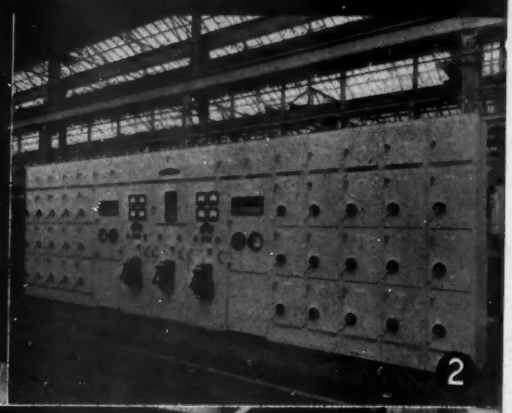

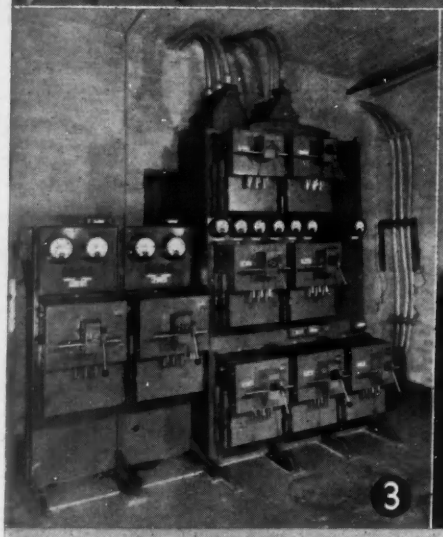

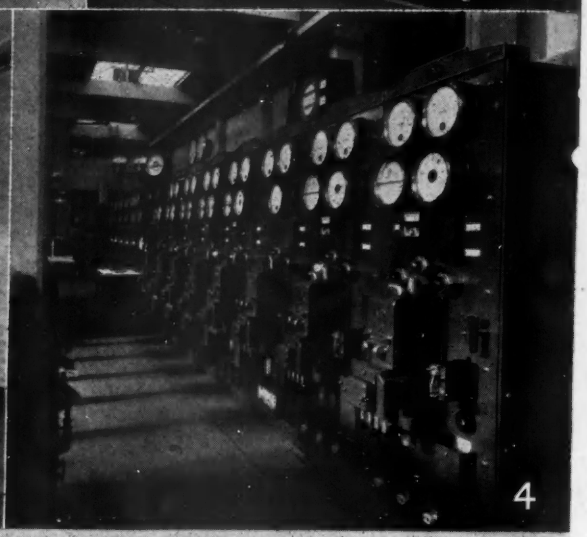

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ENGINEERING FOR THE TROPICS

It is timely that the World Power Conference should turn its attention to the special requirements of tropical and sub-tropical countries. The many papers that were presented last week at the Sectional meeting at Rio de Janeiro bear witness to the range of problems that are introduced when temperate climes are left behind, especially where electrical equipment is concerned. Moreover the importance of finding an economical solution to the difficulties that high temperatures and humidities introduce is being heightened as the use of electricity spreads into previously under-powered regions. Aside from the larger issues which the Conference has discussed, there is first importance in its consideration of the details of the preparation of plant for use in the tropics. This usually implies use in out of the way places, and there the illegibility of a mildewed label or the disintegration of a moisture-soaked instruction manual can take on the character of a major disaster. Such happenings are certainly remembered when new orders are under consideration, and if the export potentialities of the tropics are to be fully exploited by manufacturers in this country, then such details as these need constant attention. It is somewhat unusual for World Power Conferences to give close attention to the details of smaller electrical apparatus. That this attention is given underlines further the importance of manufacturers taking effective action.

SCIENCE AT SCHOOL

Science teachers in the secondary schools are the foundation of this country's system of professional engineering education. Important as are the Government decisions taken recently on colleges of technology, and the many recommendations made on this subject by the Parliamentary and Scientific Committee and other interested bodies, they are not enough. To provide improved facilities for advanced engineering training without ensuring that a more reasonable proportion of the best youngsters are persuaded to look to technology for a career is to leave a basic difficulty unresolved. It has been the constant concern of the I.E.E., as well as other engineering institutions, that engineering does not receive its deserved proportion of the best school leavers. Unless science teachers in schools can measure up to their arts colleagues in quality and in numbers, this state of affairs will continue, for the case for a technological career will never be put convincingly. The newly published recommendations prepared by a committee convened by the Federation of British Industries earlier this year to study the problems of securing

more science teachers receive emphasis from such considerations. Higher pay for teachers would obviously be a help in improving number and quality, although if this is to have any real effect, industry will have to discipline its competition for promising men. The compromise over National Service commitments which the committee suggests is still more controversial, but it might well be as effective. What is agreed by everyone, is that some decisive action is urgently required.

THE SPREAD AS BEFORE

The pattern of the estimated load spreading balance sheet for next winter is not widely dissimilar from that of last year. True, for an average cold spell there has been a two hundred megawatt gain in the race between plant capacity and prospective demand, but experience last winter showed that the top of the load curve under conditions of extreme severity had not been reached; accordingly, the B.E.A.'s estimates of load under extreme severity have been revised upwards so that the deficit forecast for such conditions remains unaltered. Again, however, the demand/plant balances vary considerably between regions, due to insufficient transmission capacity, and in consequence the national sub-committee, in their report last week, once more leaves load spreading arrangements to the discretion of the regional boards concerned. It is disappointing that a better picture cannot be presented and it serves to underline once more how the compound interest law of load growth must be matched by ever-increasing plant programmes. Certainly on the showing of the past three months there has been no easing of load growth with consumption running 10·4% above last year. Unquestionably the inclement weather has been a major contributor to this figure but the record of load increases throughout the country suggests that other factors are also contributing.

SUPERCHARGED ALTERNATORS

The cooling of large turbo-alternators has always exercised the ingenuity of the designer for it is on the efficiency of cooling that the physical size of the generator depends. Among more recent attacks on this problem is that of "supercharging" the machine, using gas at pressures as high as 30 lb/sq in. and above as a cooling medium. Full utilisation of this type of cooling however involves several unusual features, most important of which is the method of cooling of the stator. A design has now been achieved whereby the core is cooled by gas passing through longitudinal holes stamped in the coreplates, while the copper losses are taken up by gas flowing through ducts of high resistance metal in intimate contact with the copper conductors and included with them in the stator slots. The rotor is also cooled by gas passing along the slots in direct contact with the copper, the conductors being shaped to provide the gas passages. The claim is made that this technique can lead to remarkable savings in the space occupied by the machine, and this has been substantiated by the building of a prototype 40 MW set with an internal alternator gas pressure of 30 lb/sq in. Here the shorter rotor and stator, consequent on the elimination of conventional radial gas ducts and better utilisation of material, has saved, including rotor withdrawal space, some 10 ft in the length required. With a 150 MW unit the corresponding saving in length of station space would be 22 ft. Overloads too, can readily be accepted by increasing the gas pressure, and it is claimed that the 40 MW unit can generate 60 to 75 kVA with gas pressures of 40 to 60 lb/sq in. While there may be difficulties in obtaining effective sealing of the gas at these high pressures, this technique would certainly appear well worth adoption in view of the transport difficulties alone, with large stators.

WHAT IS WHITE?

Describing a colour usually poses a difficult problem for the mere male, but until a few years ago it was at least fairly safe to talk of "white" with occasional resort to "off-white" as a variant. More recently, however, the spread of the fluorescent lamp has emphasised to all that white may not be all that it seems. The illuminating engineer has a ready way out of this difficulty, and has developed the system of colour temperatures and chromacity co-ordinates, now internationally accepted, which is described in some detail in an article on a later page. The matter is of topical interest since standardisation authorities are taking pity on the non-technical user of fluorescent lamps, and at Philadelphia next month they will be attempting to take a step forward by agreeing on a maximum of three kinds of fluorescent white. This will be a welcome advance on the present puzzling profusion of imaginatively-named whites, which in the words applied by Mr W. J. Jones at Eastbourne, have "just growed." The usual advantages of a wide choice do not apply in this case, for "What is White?" is too complicated a question to answer.

DESIGN COMES TO ELECTRICITY

In recent months electrical equipment appears to be making a better showing among the samples selected by the Council of Industrial Design as specially meritorious for their general appearance. Domestic appliances which have to appeal to the female eye have always exhibited a tendency to those smooth clean lines that not so many months ago were called streamline. Now it is the turn of industrial gear to undergo a beauty treatment, and as industrial design appears to have take a turn away from the exaggerated curves of its ebullient youth we are seeing a marked improvement in design. Perhaps, with an eye focused on engineering qualities, we fail to appreciate the symmetry of the exterior until it is pointed out, none the less it is there, the better to harmonise with other modern gear with which it may be associated. This trend towards concentration on improved exterior design is to be welcomed as long as it does not interfere with engineering requirements, for works managements are giving greater attention to the brightness and general appearance of factories, some going as far as elaborate schemes of many colours. In such installations an unfortunate design of exterior of a piece of equipment may provide a needlessly jarring note.

Meteor

Colour — *and Lamps*

Implications of the Physical Assessment of Colour with Particular Reference to Fluorescent Lighting

BY F. J. G. CLACK*

IN the days when only incandescent filament lamps were on the market, the lighting engineer's knowledge of colour did not need to be very great. With the advent of discharge lamps and fluorescent tubes a much more thorough understanding of the subject became necessary. This article deals with the physical aspects of colour. No attempt is made, however, to prescribe the best type of light source for any particular job, for in solving such a problem physiological and psychological as well as physical aspects must be considered.

Light

Light is a form of electro-magnetic radiation, like radio waves and X-Rays. Electro-magnetic radiation travels as a combination of oscillating electric and magnetic forces, and the travelling oscillations are characterised by having a certain wavelength and frequency. The unit used in measuring wavelength is either the micron (one-ten thousandth of a centimetre) or the Angstrom Unit (one hundred-millionth of a centimetre).

Only radiation of wavelengths between about 3,800 and 7,600 A.U. stimulates the visual sensation and can therefore be called light. Radiation of wavelength longer than 7,600 A.U. is called infra-red radiation and is used for heating; radiation of wavelengths shorter than 3,800 A.U. is called ultra-violet radiation.

Brightness and Colour

The brightness (luminance) of an object depends on the amount of light received from a given area of it. We cannot, however, measure the amount of light merely as the amount of energy of wavelengths between 3,800 and 7,600 A.U. because the eye is not equally sensitive to all wavelengths within this visible range. Its sensitivity is at a maximum for wavelengths in the middle of the range and falls off to zero towards the extremes. To put this another way, far more energy is needed to produce a given amount of light at a wavelength of 6,500 A.U. than at a wavelength of 5,500 A.U. because of the relative insensitivity of the eye to radiation of the former wavelength. Therefore in measuring the amount of light, the energy at each wavelength must be multiplied by an appropriate factor called the relative luminous efficiency; the unit of light, or to use the proper technical term, the unit of luminous flux derived in this way, is called the lumen.

The term "brightness" is now officially deprecated in the sense intended here but, as at one or two other places in this article, the author has used the everyday word. For the approved official terms and definitions, reference should be made to British Standards 233 and 1611.

If an electric lamp could be made which would convert all the input energy into light at a wavelength of 5,550 A.U. the wavelength of the eyes' maximum sensitivity, its efficiency would be about 680 lumens per watt. This is not possible, however, and as will be shown later it is usually undesirable for all the radiation from the lamp to be concentrated in one part of the visible range, because this results in poor colour-rendering.

Colour and brightness are two separate characteristics and the colour appearance of an object depends on the relative proportions of the different wavelengths in the radiation being emitted or reflected by the object.

The colour mechanism of the eye seems to consist of three systems*, each responding to a limited range of wavelengths within the visible range of 3,800—7,600 A.U. One system, sensitive to the longer wavelengths of the visible range, gives rise to the colour sensation we call red; another system is sensitive to the middle part of the range and gives rise to the colour sensation we call green; the third system, sensitive to the shorter wavelengths of the range, gives rise to the colour sensation we call blue.

The colour seen is determined by the relative intensities of stimulation of these three systems. For example, if all three are stimulated to more or less the same extent, the colour sensation of white is produced; or if the red and green systems only are stimulated to roughly the same extent, the colour sensation of yellow results. The three limited ranges overlap to some extent.

**Osram Technical Section, The General Electric Co., Ltd.*

**The physiology of colour vision is not fully understood as yet, and the simple statement given is in no way exhaustive.*

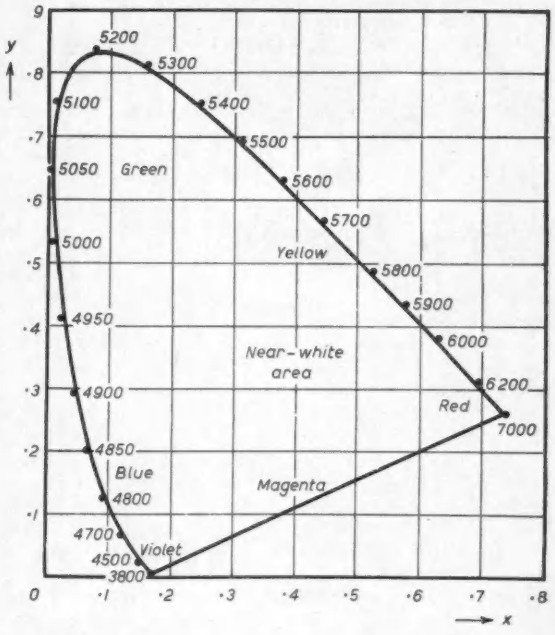


Fig. 1. This chart is a representation of C.I.E. Chromaticity Diagram

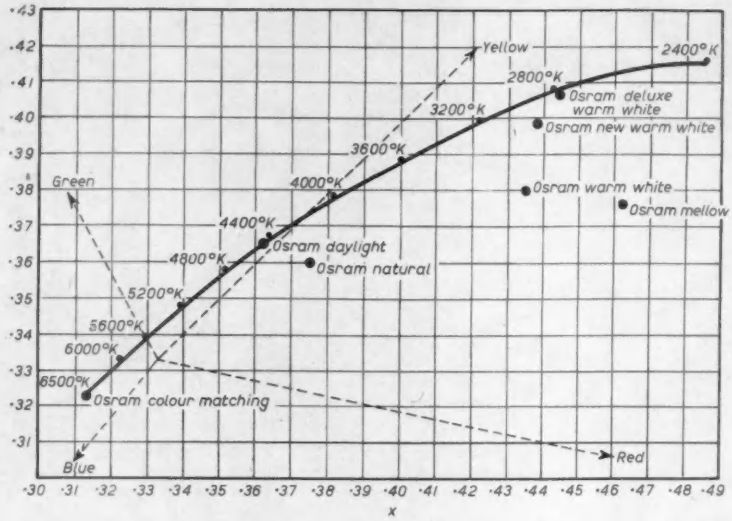


Fig. 2. This represents an enlarged section of the near-white region of the C.I.E. Chromaticity Diagram. Its position with respect to Fig. 1 can be readily located by the values of the coordinates. The black line represents the full radiator or black body locus.

If the wavelengths present in sunlight are separated in the form of a spectrum by means of a prism it is easy to see how the different wavelengths give rise to different colour sensations. The reason that radiation of wavelengths of about 5,800 A.U. produces the sensation of yellow is that it stimulates both red and green systems of the eye to about the same extent.

Colour Rendering

The colour appearance of an object, as explained above, depends on the relative proportions of the different wavelengths present in the radiation received from it. In the case of objects which are not themselves emitters of light, this depends in turn upon the reflection properties of the object and the spectral composition of the light incident upon it. For example, an object capable of reflecting only blue light will appear black if seen by light which does not contain blue light.

Most light sources emit over a fairly wide range of wavelengths and if a green spotlight is shone on an object which is only capable of reflecting yellow light, that object will appear dull yellow or brown depending upon whether the incident light, which is predominantly green, contains a fairly high or a low proportion of yellow light. The colour known as brown is low-brightness yellow.

Most objects reflect over a fairly wide range of wavelengths and can therefore have their appearance altered in colour as well as brightness by changes in the composition of the incident light. For example, if an object which is capable of reflecting blue and green light is seen by a blue light, it will look blue, and if it is seen by a green light it will look green.

To render colours well a light must obviously have a reasonable amount of energy in all parts of the visible range; daylight satisfies this requirement and since the colour appearance of an object by daylight is generally regarded as being its natural colour, the nearer the spectral energy distribution of the light to that of daylight the better will be its colour-rendering properties. In fact daylight is somewhat variable in spectral composition, but the eye is so adaptable that the changes are not normally noticed. A rough approximation to the sort of spectral distribution experienced in daylight is that of the light from an object at a temperature of 6,500° K (6,227° C) and this is the distribution frequently aimed at when designing lamps or lighting units for matching colours. The colour temperature of the light from the sun's surface is effectively about 5,500° K. Sources of reddish or "warm" colour appearance with good colour rendering properties can be produced, but their light is bound to a be a little deficient in blue.

It is important to remember that the colour appearance of a light source tells us little about its colour rendering

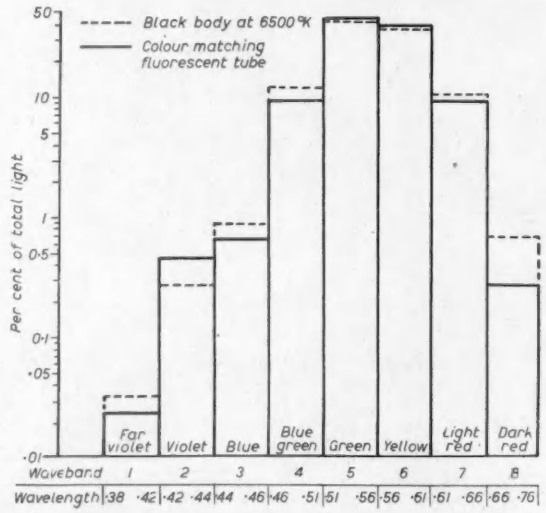


Fig. 3. Comparison between a colour matching fluorescent tube and a black body (dotted) at 6,500°K

properties, especially if the colour appearance is a near-white. For example, the colour appearance of a sodium discharge lamp and a yellow sprayed filament lamp are very similar, but their colour rendering properties are very different because their radiations have such different spectral energy distributions. The sodium lamp produces a practically monochromatic line spectrum whilst the yellow sprayed filament lamp produces a continuous spectrum covering the whole of the visible range with yellow predominating.

Other examples are the Ordinary and De Luxe colours of fluorescent tubes. The standard colour and the corresponding De Luxe colour tubes have the same colour appearance but the De Luxe colour tube has better colour rendering

properties, producing light richer in blue and red. The better colour rendering properties of the De Luxe colours are achieved at the price of lower efficiency.

It is quite easy to see how there is a compromise between efficiency and colour rendering properties. The eye is most sensitive to yellow and green wavelengths and the richer the light is in these wavelengths, other things being equal, the higher will be the efficiency. On the other hand reasonable proportions of blue and red wavelengths are necessary for good colour rendering and so raising the efficiency by concentrating the energy in the middle of the visible range results in poorer colour rendering.

Colour Appearance

Additive colour mixing to obtain any desired colour by shining various amounts of red, green and blue light (the three primary colours) on to a white screen is a process familiar to many. (Obtaining various colours by mixing paints is a different phenomenon known as subtractive colour mixing, and does not concern the subject of this article.)

The Commission Internationale de l'Eclairage (C.I.E.), which meets every few years to discuss lighting matters, adopted a system for specifying colour appearance based on additive colour mixture in 1931. So that the system might embrace all real colours, including those of every individual wavelength, or spectral colours as they are called, three imaginary "colours" were chosen as the primaries instead of red, green and blue. The specification of primary colours is to some extent arbitrary, and to be precise the exact kind of red, green or blue adopted must be stated. The fact that the C.I.E. saw fit to adopt imaginary primary colours need cause no confusion, the principles of additive colour mixture still apply.

Any colour can be matched by a mixture of the three imaginary primaries, which are called X, Y and Z; and the proportions of X, Y and Z required are said to specify the colour. For example a certain colour may be matched by a mixture of 0·2 of X, 0·5 of Y and 0·3 of Z. In general terms, any colour may be expressed in the form $xX + yY + zZ$ and since $x + y + z$ always add up to 1, it is only necessary in practice to quote two of the three proportions. It is usual to quote x and y.

If a diagram is plotted on a sheet of graph paper with the vertical axis y and the horizontal axis x, it is found that all the real colours lie in a horseshoe-shaped area as shown in Fig. 1. It will be observed that the point whose co-ordinates are $x = 0{\cdot}333$, $y = 0{\cdot}333$ represents a colour which is matched by a mixture of all three primary colours in equal amounts and is in fact white. It will also be observed that the point whose co-ordinates are $x = 0$, $y = 0$ represents the "colour" Z, that whose co-ordinates are $x=1$, $y=0$, the "colour" X; and that whose co-ordinates are $x=0$, $y=1$ the "colour" Y.

An important thing to know is that lights of any real colours within the horseshoe can be mixed together to produce colours which lie within the area bounded by lines joining them. Two colours can be mixed to produce any colour lying on the straight line joining them, but no other colour. This is of great importance when blending phosphors for fluorescent tubes.

Although there are strongly coloured fluorescent tubes on the market, most of those used for general lighting are of near-white colour appearance.

An enlargement of the near-white region of the C.I.E. Chromaticity Diagram as it is called is shown in Fig. 2 and on it are plotted the colour appearances adopted at the present time for some British made fluorescent tubes. Although points are plotted on the diagram, it should be remembered that every manufacturer has to set tolerances for the colour appearance, or chromaticity as it is called, of his tubes.

On many chromaticity diagrams there is plotted a curved line known as the full radiator or black body locus. This is a line which traces the colour appearance of a theoretical object called a full radiator, or black body, as its temperature is varied; a tungsten filament radiates in much the same way as such a body. The locus runs through the near-white area of the diagram for temperatures between about 2,000 and 7,000° K and provides a convenient means of reference when describing the bluishness or reddishness of a fluorescent tube.

The chromaticity of most fluorescent tubes for general lighting purposes lie on or near the black body locus so that, provided the situation is fully understood, there is not much harm in saying that a certain fluorescent tube has a colour temperature of so many degrees. Strictly, this is inadmissible, as reference to the definition of colour in B.S. 1611 shows. The following colour temperatures may be assigned to the fluorescent tubes marketed by The General Electric Co., Ltd.

Colour Matching	6,500°	a special-purpose colour
Natural	4,200°	cool colours
Daylight	4,500°	cool colours
New Warm White	2,900°	warm colours
Deluxe Warm White	2,800°	warm colours

Colour Rendering Properties

As has been stated, the colour rendering properties of a light source are determined by its spectral energy distribution or spectral luminance distribution—the latter being merely the former weighted by the relative luminous efficiencies of the different wavelengths. To simplify measurements and recording the C.I.E. decided in 1948 to split the visible range into 8 wavelength bands as follows (the fact that 3,800 and 7,600 A.U. were actually taken as the limits of

SPECTRAL LUMINANCE DISTRIBUTIONS FOR VARIOUS LIGHT SOURCES

Approximate Percentage Luminance in Spectral Bands

Commercial Designation			Fluorescent tube, type MCF										Mercury		Sodium	Incandescent Filament	Black Body	
			Daylight	Warm White	Natural	Colour Matching	Mellow	New Warm White*	Deluxe Warm White*	Red	Blue	Green	Yellow	type MA	type MB	type SO	2800°K	4800°K	6500°K
Band	Wave length limits (micron)																		
1	·38–·42	Far Violet	0·013	0·010	0·014	0·021	0·009	0·008	0·008	—	0·13	0·005	—	0·003	0·005	—	0·006	0·021	0·032
2	·42–·44	Violet	0·34	0·29	0·37	0·47	0·32	0·26	0·27	—	1·5	0·17	—	0·39	0·47	—	0·06	0·18	0·26
3	·44–·46	Blue	0·37	0·17	0·35	0·62	0·11	0·15	0·05	—	2·3	0·03	—	0·029	0·067	—	0·25	0·60	0·83
4	·46–·51	Blue-Green	5·6	2·5	5·0	9·0	1·8	2·2	2·3	—	17·8	5·2	0·1	0·62	0·98	—	5·3	9·0	10·6
5	·51–·56	Green	39·0	29·2	36·1	43·6	27·5	30·7	36·7	1·0	57·9	79·0	22·1	49·3	52·4	—	33·5	39·8	41·8
6	·56–·61	Yellow	46·7	56·0	48·5	37·1	53·1	56·6	44·2	20·5	18·6	13·9	63·5	49·0	45·2	99·1	42·7	38·0	35·8
7	·61–·66	Light Red	7·8	11·5	9·4	8·9	16·7	9·9	16·0	73·1	1·76	0·65	14·0	0·65	0·86	0·9	16·6	11·5	9·9
8	·66–·76	Dark Red	0·22	0·33	0·25	0·28	0·50	0·21	0·48	5·4	0·02	0·02	0·43	0·05	0·04	—	1·54	0·86	0·68

the visible range is of little consequence as strictly speaking there are no very definite limits to the visible range):

Band		
1	3,800–4,200 A	Far Violet
2	4,200–4,400 A	Violet
3	4,400–4,600 A	Blue
4	4,600–5,100 A	Blue-Green
5	5,100–5,600 A	Green
6	5,600–6,100 A	Yellow
7	6,100–6,600 A	Light Red
8	6,600–7,600 A	Dark Red

Thus it is usual to quote eight figures giving the percentage of the total luminance or energy in each band when specifying the colour rendering properties of a fluorescent tube and this information may be plotted as a block diagram if desired. After some experience it is possible to interpret such figures by comparison with those for lamps of well-known colour rendering properties. Such figures, with suitable tolerances, are adopted by most manufacturers of fluorescent tubes as part of their specification.

Approximate spectral luminance distributions for various light sources are given in the accompanying table. Those for the colour matching tubes and a black body at 6,500° K are compared as block diagrams in Fig. 3. It will be noticed that all fluorescent tubes are inherently rich in violet because of the strong violet line of the mercury spectrum which shines through the phosphor from the discharge itself. It is possible, though, as with the colour matching tube, to minimise the effect of the violet line by having plenty of radiation in the adjacent blue and blue-green bands, bands 3 and 4.

It will also be noticed that fluorescent tubes tend to be deficient in dark red, due to the fact that none of the phosphors used emits much radiation in this region of the spectrum. Nevertheless, several phosphors which produce a fair amount of dark red radiation have recently been developed and it is now possible to make tubes producing a higher proportion of their radiation in band 8 than formerly, if this should be considered desirable. An increase in the luminance in band 8, other things being equal, is necessarily accompanied by a reduction in the luminous efficiency of the tube, but there are indications that users are becoming more critical of the colour rendering of tubes and are prepared to accept lower efficiencies for improvement in this respect.

M.K.S. Units

Conversion Procedures for Mechanical and Electrical quantities

By J. E. MACFARLANE, B.Sc.(Eng.), M.I.E.E., A.M.I.Mech.E.

IN calculations dealing with electrical machines, mechanical quantities such as the polar moment of inertia and torque are often required whilst synchronising torque and the power in synchronous watts are electrical quantities. A former article* described simple calculations in m.k.s. and gravitational units, and these further examples amplify these simple examples for more advanced students.

Example 1. Calculate the energy stored in a d.c. armature of 0·66 m diameter weighing 900 kg and rotating at 330 r.p.m. Assume the radius of gyration is two-thirds of the radius of the armature core and "g" is 9·81 m/sec². Give your answers in (*a*) gravitational or engineers' units (m-kg) and (*b*) m.k.s. units (Joules). If a retarding force of 2·5 kg (or 24·5 Nw) exists at a radius of 0·2 m, how many revolutions will the armature make in coming to rest and what time will it take?

(*a*) The radius of gyration, $k = \frac{2}{3} \times \frac{0{\cdot}66}{2} = 0{\cdot}22$ m.

The polar moment of inertia, $J = \frac{W}{g} k^2$

$$= \frac{900}{9{\cdot}81} \times 0{\cdot}0484 = 4{\cdot}43 \text{ kg. m}^2.$$

The angular velocity, $\omega = \frac{2\pi N}{60} = \frac{2\pi \, 330}{60} = 34{\cdot}5$ radians/sec.

The stored energy is the rotational kinetic energy and is given by $\frac{1}{2} J\omega^2 = \frac{1}{2} \times 4{\cdot}43 \times 34{\cdot}5^2 = 2{,}640$ m-kg.

The number of revolutions in coming to rest is given by the kinetic energy divided by the work/revolution, i.e.

$$\frac{2{,}640}{2\pi \times 2{\cdot}5 \times 0{\cdot}2} = 840 \text{ revs.}$$

The average speed is 330 ÷ 2 = 165 r.p.m. so the time taken to come to rest is 840 ÷ 165 = 5·1 min.

(*b*) Rotational k.e. $= \frac{1}{2} mk^2 \omega^2$

$$= \frac{1}{2} \times 900 \times 0{\cdot}22^2 \times 34{\cdot}5^2 = 25{,}900 \text{ joules}$$

(as 1 joule = 0·737 ft lb this is 19,100 ft lb in engineer's units.

No. of revs in coming to rest $= \frac{25{,}900}{2\pi \times 24{\cdot}5 \times 0{\cdot}2} = 840$ revs

and as before the time taken is 5·1 minutes.

In calculations on a.c. machines, the synchronising power of alternators is often required and on induction motors torque may be given in "synchronous watts". The synchronous watt is defined as that torque which at the synchronous speed of the machine will develop a power of one watt.

Example 2. A ten-pole 50 c/s alternator has a synchronising power of 455 kW/mechanical degree of rotor displacement when operating at its rated load. Calculate the synchronising torque in Nw-m and kg-m.

The electrical power is E I cos θ joules/sec = T ω mechanical joules/sec, where T is the torque in Nw-m (in this case the synchronising torque) and ω is the mechanical angular velocity of the alternator. The alternator speed in revs/sec, n = 50 ÷ 5 = 10 revs/sec, so the angular velocity $\omega = 20\pi$ rad/sec.

Hence the synchronising torque $= \frac{455 \times 10^3}{20\pi} = 7{,}250$ Nw-m.

As 1 kg = 9·81 Nw, this can also be expressed as 7,250 ÷ 9·81 = 740 kg-m. From the above it will be seen that the Newton has a similar relationship to the kilogram, with "g" = 9·81, as the poundal has to the pound weight with "g" = 32·2.

Example 3. A 2,000 h.p., two-pole, 50 c/s induction motor when started direct-on has a starting torque of $3{\cdot}12 \times 10^6$ synchronous watts. Calculate the starting torque in Newton-metres and tons-ft. Assume 1 ton = 1,618 kg and 1 metre = 3·28 ft.

The synchronous speed is 3,000 r.p.m., and n = 50 revs/sec., so $\omega = 100\pi$ rad/sec.

Torque in Nw-m $= \frac{3{\cdot}12 \times 10^6}{100\pi} = 9{\cdot}95 \times 10^3$ Nw-m.

Torque in tons-ft $= \frac{9{\cdot}95 \times 10^3 \times 3{\cdot}28}{9{\cdot}81 \times 1018} = 3{\cdot}26$ tons-ft.

* *"M.K.S. Mechanical Units"* ELECTRICAL TIMES, *31st December, 1953, p. 1235, Vol. 124, by J. E. Macfarlane.*

World Power Conference discusses Problems Arising with Tropical Plant

FOR its sectional meeting in Rio de Janeiro last week, the World Power Conference appropriately enough gave particular considerations to the special power problems of tropical and sub-tropical regions. There was, however, no neglect of the broader topics with which the Conference is generally concerned. For instance, the first of the sections into which the papers were divided took the wide title "Planning of the Electric Power Industry" but its two main sections have an immediately apparent connection with current problems of the low latitudes: "Planning the electric power industry with regard to the co-ordinated planning of other economic activities," and "The thermal power plant as the complement of hydro-electrical developments, in regions of abundant hydraulic potential."

Other sections in which papers were presented were: the electric power industry in tropical and sub-tropical regions; natural and derived fuels; wind power; solar energy; the uses of electric power; and international hydro-electric developments.

The meeting, which was attended by a number of delegates from Great Britain was held in the Hotel Quitandinha and technical sessions continued until Saturday last. Two tours have been organised to follow the technical sessions, and these are now taking place. They include visits to some of the large power stations now being built in Brazil, including some of the sizable hydro-electric stations.

With so wide a field of subjects considered at the meeting, the summary of the papers that follow is necessarily selective. It is hoped to extend it, however, by reports on the discussions on the papers, in an early issue.

Planning for Power

The first section of the Conference was devoted to planning of the electric power industry. Here several papers were offered dealing with development in individual countries. Of more general tenor was the contribution made by Messrs Ross W. Davidson and Howard L. Melvin, of the U.S. National Committee, on necessity for adequate and economic electric power to a sound economy. Complementary to these papers, however, were those in Section 2, where the question of steam power and thermal power as supplementary energy sources was discussed. Richard L. Hearn, of the Ontario Hydro-Electric Power Commission, for example, dealt with the programme of electricity development which had been carried out in the Province. It was in 1926 that long term planning for the system began to be carried out, and with the aid of supplies from Quebec, no serious difficulties were experienced until 1947 when demand began to outstrip supply; at the same time there was a serious shortage of water. It was consequently decided to erect two thermal plants with a total capacity of 664 MW. Alleviation of the restrictions on Niagara water permitted the construction of the Sir Adam Beck No. 2, and future hydro development now depended on the St. Lawrence River project.

In Sweden, as Messrs Folke Petri and Lars Lingstrand pointed out, steam stations were used both as base load under power shortage conditions and as peak load generators at other times. Total steam power in the country was about 900 MW and water power was about 4,000 MW. There was also a not inconsiderable amount of industrial back-pressure generation. Calculations showed that a steam power supplement of about 10% gave an economical optimum and the present excess was due to the fact that steam stations could be built more quickly than hydro to fulfil a sudden increase in demand. It is expected that by 1975 water resources will be fully utilised and future development will be on the steam side.

In Japan, according to Mr Junji Noda, the optimum ratio of steam to hydro is as 5 to 9. British hydro-power was dealt with by Messrs J. D. Peattie and A. A. Fulton, who gave details of the Scottish and other hydro projects. They gave an historical account of the development of the water resources of Great Britain and showed how integration of hydro and thermal generation was significant in Scotland. Scottish hydro schemes in various stages of development had a total capacity of 1,215 MW. Thermal plant was increased annually following a programme designed to provide nationally the bare minimum of capacity required to meet the winter peak. The North of Scotland Hydro Board provided additional capacity having regard to financial and other considerations. At thermal stations, fuel storage up to 25% of the annual consumption was provided while for hydro plant sufficient reservoir capacity was made available to deal with seasonable changes in the relation between run-off and demand. In 1952, hydro stations supplied 22% of the Scottish output, and in the early 1960's this figure should rise to 30%. Recent investigations point to a potential hydro output of about 10,000 million units/annum.

The Italian situation was covered by Mr Mario Mainardis. At the end of 1952, there was 7,200 MW of hydro against 1,700 MW of thermal. At present comparative figures are hydro, 7,500 MW; thermal, 2,050 MW and in 1955 it is expected that hydro will have reached 9,500 MW while thermal will be 2,500 MW. Following the poor rainfall in the years 1947-8-9, it has been decided to increase hydro and thermal power in the same proportions and to use thermal stations as base load, with frequency control and peak loading exercised from the hydro plant.

Wind Power

General views on the problems of utilising wind power were presented by Mr E. W. Golding (E.R.A.) in his paper on Economic Aspects of the Utilisation and Design of Wind Power Plants. This did not go into the detailed design of equipment, but rather presented an appraisement of the general situation, including such factors as choice of site, economic utilisation of wind driven machines of differing sizes, storage of energy, operating range and so on. More specific, however, was the Italian paper on the same subject by Professor Renzo Vezzani who, after a preliminary section on wind, went into experiments which had been carried out on Venturi tubes. These tubes provided an apparent amplification of the aerodynamic power at the throat due to the partial conversion of pressure head into velocity head, and could thus be used in con-

junction with smaller wind turbines than those exposed to the direct force of the wind.

From Algiers also came a paper on this subject by Mr H. Duquennois. This investigated the practicability in Algeria of co-ordinated wind/hydro electric generation, and it was concluded that due to particular local circumstances a fair measure of co-ordination could be usefully achieved.

Solar Energy

Two papers dealt with the problems of utilisation of direct solar energy. Messrs Betier, Murat and Frixon reported some experiments which had been carried out in Algeria using a parabolic mirror with a useful reflective surface of about 50 sq metres. The reflecting surfaces were of aluminium which were able to reflect practically the whole of the useful solar energy and did not use an intermediate mirror. This made it necessary to keep the axis of the parabola directed toward the sun, and, consequently, required a drive similar to those used for astronomical telescopes. The aluminium was polished by electrolytic means and then coated with a film of synthetic transparent plastic to preserve the reflectivity of the surface.

Primary purpose of the equipment was to synthesise nitric oxide by a thermal means, and at the focus of the mirror temperatures as high as 3,000° C had been attained.

The interest in this experimental plant lies in the fact that North Africa and the Sahara have wide stretches of land which receive a great deal of sun and are not meant, at least for the time being, to be used for any agricultural or industrial development.

A general paper on solar energy was presented by Hugo Melzer of Brazil. This, however, covered practically all forms of energy which are currently being produced directly or indirectly from the sun. One of the interesting sections in this paper was that dealing with induced electric currents in ionosphere "friction layers" and annular winds. The annular winds theoretically exist due to interaction of positive ions and negative electrons in the ionosphere, with the earth's magnetic field, and their presence has been confirmed by high altitude flights at a height of about 13 kilometres. In the ionosphere at approximately the height of the "E" layer electronic wind velocity has been measured of the order of 150 to 230 feet per second in an easterly direction, the influence of solar radiation manifesting itself clearly by velocity increases of up to 900 ft/sec on the occasion of geomagnetic disturbances.

By using certain assumptions it is possible to get a rough idea of the order of magnitude of the electrostatic energy stored in the ionosphere which works out at about 300×10^{18} units. This energy is available at voltages of the order of some billion relative to earth. In comparison with the energy stored and being produced in the lower levels, the troposphere and the clouds, this figure is enormously high, the low level power being intermittent and corresponding only to 720 MW in total spread all over the globe.

A review of the potentialities of energy derived from thermal differences in the ocean was given by Pierre Casal of Brazil who considered principally the low temperature turbine to be tried out at Abidjan. He showed that this type of plant could be usefully employed on the North-east shore of Brazil both for the generation of electricity and also for fresh water and salt production.

Messrs A. Parker and T. F. Hurley went into the problems of burning vegetable wastes. As far as true combustion went, there was little difference between most vegetable wastes and coal, but the physical characteristics of these wastes made it necessary to introduce many modifications into coal burning plant.

Atmospheric electricity also formed the subject of a paper by Messrs R. E. Holzer and G. F. Schilling. They divided the atmosphere into two distinct regions: the ionosphere and the atmosphere below the ionosphere. The former was a region of high electrical conductivity, low electric fields and a dominantly horizontal current system. The lower section had larger electric fields, low conductivity and principally vertical currents. Due, however, to the low rate of time change of ionospheric currents the useful energy available was negligible. The authors gave the analogy of the earth and ionosphere with a leaky spherical condenser with a charge of about 400,000 coulombs. The p.d. across the condenser was about 400 kV and the downward leakage current about 1,800 amps. This current was maintained by thunderstorms. In order, therefore, to realise a commercial supply of energy it would be necessary to establish a conductive path about 40 miles high—and this is not feasible.

Tropical Equipment

Special qualities required in electrical equipment for use in tropical and sub-tropical climates is the subject of a whole series of papers, and there is a reassuring degree of agreement amongst them. Here, attention is mainly devoted to the paper prepared by members of the B.E.A.M.A. which Mr H. Astbury edited for presentation to the Conference. It has the title "The Design of Electrical Equipment for Use in Tropical Climates."

Conditions to be dealt with in the tropics may be summarised as temperature, humidity, fungi, rodents, insects, sunlight, salt and dust. When the final location of the plant is known with some precision, then there is usually little difficulty in providing satisfactory protection; in other cases, the worst of all conditions must be assumed and suitable steps taken.

High temperatures act on machine insulation by reducing life, and it may sometimes be necessary to go to a higher grade of insulation for tropical use, or else to derate the machine. It is important to protect such temperature-sensitive component parts as capacitors from conduction of heat from associated apparatus, and due allowance must be made by means of expansion joints in conductors, etc., for the greater temperature range to be expected in all machine components. Careful attention to the calibration of instruments is required, especially if rectifiers are incorporated.

Humidity presents problems that are associated with the temperature range, showing themselves as condensation in some form. This may occur even inside totally enclosed motors, and some provision must be made for it. In a moist atmosphere, fungi will grow rapidly on many kinds of insulating material, and although the necessary conditions are unlikely to occur in operation, they may appear during transport to the country of use. Rodents and insects consume materials used in electrical apparatus, and require additional attention to mechanical protection.

Absorbent cellulose insulation such as cotton and paper has been a source of trouble under tropical conditions. However, if proper impregnation is carried out, such insulation can be rendered immune from deterioration. Linseed oil base varnishes need to be avoided, but most modern varnishes of the alkyd or oil-modified phenolic types are found to be excellent. The surface sealing of insulation is a feature to be watched, as stray fibres of cellulose protruding through the surface skin after normal insula-

tion may carry water into the inside of the insulation and form a medium for mould. For high temperature work, resort is often had to Class B insulation, while a number of plastics have recently become available that are well suited for this type of application.

Conventional lubricating systems are found to be satisfactory on tropical equipment provided plain soda greases are avoided. Lithium greases give promise of being highly satisfactory, but experience is so far limited.

Packaging and Protection

Packaging of equipment for its journey to the tropics is of major importance, and considerable attention is given to this topic in the paper. Small items may be wrapped in waxed paper together with a desiccant, and then dipped in molten wax; wrapped in an aluminium foil laminate, and then sealed as a package; or dipped in a hot ethyl cellulose compound. This last method gives a strong film which can nevertheless be removed readily with stripper tape or thread. Whichever method is used, careful attention must be given to ensure that all labels and transport instructions are printed on permanent materials.

Where long term storage is required, enveloping in a cocoon of a suitable plastic has attractions. A desiccant can be incorporated in the package, and a transparent observation window provided.

To protect metals in tropical climates, the application of an organic coating gives good results. However, it is best to pre-treat the metal by some such method as phosphating. This retards corrosion prior to application of the final coating, and also provides a good absorbent base for the organic coating. Application of some metal as a preliminary coating is an acceptable alternative. Afterwards, an application of at least three coats of paint should be made to bare metal, and two to phosphated metals. Paint thickness is the important factor rather than number of coats. There are a number of fungicides which may be safely incorporated in the paints and which inhibit the growth of fungi, but some others may prove corrosive.

Summing up, the paper emphasises that equipment for overseas should be designed for the simplest possible servicing. Such equipment should be shipped with clear instructions for operation and maintenance, and the paper used for the manual giving this information should be of first quality, properly treated against fungus, and wrapped in a watertight envelope.

Foreign Ideas

In the Italian paper on the subject, which is by Dr Ing M. Signorile, mass production of machines totally protected against the action of tropical climates is considered practical for sizes below 5 kW. Such machines should, it is suggested, be totally enclosed, externally ventilated. Particular importance is attached to avoiding the deposition of dust inside machines. It is considered that the extra cost for special tropical machines can be kept down to 5%.

A paper from Shigenari Miyamoto (Japan) describes the test code adopted in that country for equipment for tropical use. Dry type transformers are coming into wide use in Japan where there is serious fire hazard under conditions of high temperature and humidity. For oil immersed apparatus, sealing-off with oil is often resorted to, with a layer of nitrogen between the sealing oil and the insulating oil to inhibit deterioration. Heaters are incorporated inside switchgear cubicles and machine casings to prevent condensation of moisture when the load is removed. An example quoted is a 5 kW heater in an 11·5 MW generator.

Power Station Design

A paper by Mr W. K. Carruthers (Montreal Engineering Co., Ltd., Canada) discusses features of power station design for tropical and sub-tropical conditions. It is considered that power station buildings must be very open structures, to allow for a maximum of air movement. Where this is not possible, as in control rooms, resort must be had to air conditioning. In spite of this accent on open construction, however, it is necessary to give some protection against driving wind and rain.

All motors need to be conservatively rated. There is a tendency to specify water cooling for essential auxiliaries, where this is at all practicable. Special arrangements are required to protect bearings on driven equipment from the effects of high temperatures. It is suggested that required factors of safety should vary as the square of the temperature involved.

The paper suggests that opinion is still well divided as to the respective merits of indoor and outdoor installations. The main difficulty with the latter is that of making provision for routine maintenance and emergency repairs irrespective of the weather conditions. If a shelter for such operations is envisaged, it should be of such a type that the gantry type crane can operate either through it or underneath it. Much depends on the stability of the weather, but, in the author's opinion, a reasonable compromise is to enclose the turbine room and boiler fronts only, leaving the rest of the station outdoors. This method has been employed with success in Demarara and Venezuela.

Tropical systems, except in highly industrialised regions, are independent of one another, and so special measures to ensure reasonable supply continuity are required. Particularly important is the provision of a separate source of station service. There are load characteristics to consider as well. The effective absence of twilight means that the lighting load comes on very suddenly. In one example quoted, which refers to Georgetown, British Guiana, 2·5 MW is added in from 10 to 15 minutes to give a peak of 5·3 MW. One hour later, there is a drop of some 4·1 MW to night loads. Such peaks mean that obsolescent and relatively inefficient equipment may have to be kept in service.

Factors affecting the design of hydro-electric, as distinct from thermal power stations, are considered in a paper by Mr J. K. Sexton (Chief Civil Engineer, Montreal Engineering Co.). The design of such stations in tropical and sub-tropical areas is influenced by high temperatures, extremes of humidity, hurricane winds, high floods, a wide variation of streamflow and silt-laden river waters, to mention only a few hazards. Water power is usually subordinated to irrigation, and most large projects are jointly developed to serve both purposes. On the other hand, design is simplified by the absence of freezing conditions.

Probably the most common problem of the tropics is protection against high flood water, and more attention is being given to underground power houses on this account. They may be constructed as underground chambers excavated out of the rock or as open pits in the high ground beside the river.

Though well-removed from the tropics, the subject of the Niagara Falls development formed the subject for another paper, this time by Mr F. L. Adams, Chief of the Bureau of Power of the U.S. Federal Power Commission. The negotiations necessary between Canada and the U.S.A. for the development of this "one of the world's best power sites" are discussed in some detail. As a result of a recent treaty liberalising the use of the waters in the Niagara River, Canada is increasing power facilities by 1,375 MW and tentative plans have been made for a further 1,330 MW capacity on the U.S. side.

Modernising the Smaller Mill

Steam-Engine Driven Alternator for Electricity Supply

THAT production efficiency can be improved by making full and best use of sound existing plant and, where necessary, by installing new plant in place of that which is completely out-dated and worn-out, is well appreciated, of course, in the textile industry. Many of the larger textile manufacturers have in fact made it a fundamental feature of their policy to maintain production efficiency at the highest possible level in this manner. Where some of the smaller manufacturers are concerned, however, a plant development scheme needs extra careful consideration on account of there usually being a more limited amount of capital available. It is not quite so often that one hears of smaller manufacturers installing new machinery or, what may be almost as effective, generally modernising existing plant so that old machinery can be used to best advantage.

Perhaps another of the reasons for any reluctance on the part of the smaller manufacturers to act in this respect is that the textile industry is generally faced with rather uncertain prospects. Today, the effects of the fairly serious recession in the autumn of '52 are still very much in mind, though it must be remembered that there have always been pessimistic manufacturers during the past thirty years who have consistently refused to modernise their mills because they have been waiting for a major slump—"always just around the corner." During boom periods these were the manufacturers who were unable to take full advantage of the spate of orders available, for with their inefficient plants, they were quite unable to offer delivery dates acceptable against their larger competitors.

A Smaller Manufacturer

In contrast to many smaller manufacturers who were seldom ready to risk investment in new equipment with the object of raising production efficiency to meet and beat increasing world competition, the firm of John Wilson (Gildersome) Ltd., near Leeds, stands out as a good example of what a small firm can achieve by initiative and enterprise.

John Wilson (Gildersome) Ltd., is a family firm that was founded in 1861, and is now carrying on a steadily expanding business in the manufacture of materials that are in great demand for school clothing and uniforms etc. The firm has prospered by building up an extensive trade overseas, as well as at home.

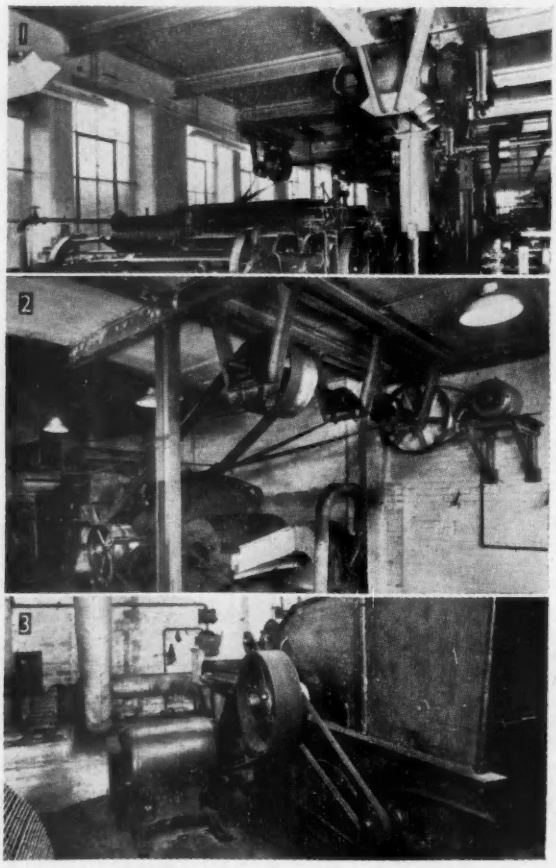
In 1945 the mill at Gildersome was equipped in some departments with plant of late nineteenth century manufacture, but today the position has changed considerably, new machinery being installed and in operation side by side with the best of the old equipment. In the weaving shed, for example, one can see a number of 1890 looms in operation alongside Northrop automatics.

The line shaft power transmission system in the mill was originally driven by an 800 h.p. horizontal tandem condensing steam engine with a flywheel speed of 100 r.p.m., an arrangement which, like so many similar systems still employed in other mills, entailed about 750 yards of main line shafting together with belts and counter shafting. Such arrangements are by modern standards most inefficient, and from the point of view of the maintenance expenditure entailed to prevent frequent breakdowns alone, they are most uneconomical in operation. At Gildersome, moreover, the installation of new machinery specifically designed for individual drive by built-in motors was quickly making the belt transmission system redundant, and so it was decided after careful consideration to scrap all the main line shaft and pulley drives, to install a new electrical distribution system throughout the mill and to convert all the machines to either individual drive or group drive.

Main Supply

In making this decision it was then necessary to consider whether the electricity supply should be taken from the bulk supply of the Yorkshire Electricity Board or from a new alternator driven by the existing steam engine. Bearing

Methods of drive adopted in mill modernisation. Fig. 1 (top) Line shafting of scribbling and carding machines driven from motor at top of roof stanchion. Fig. 2, wall mounted motor using existing shafting to drive willey. Fig. 3 Floor mounted motor in foreground driving a rag pulling machine



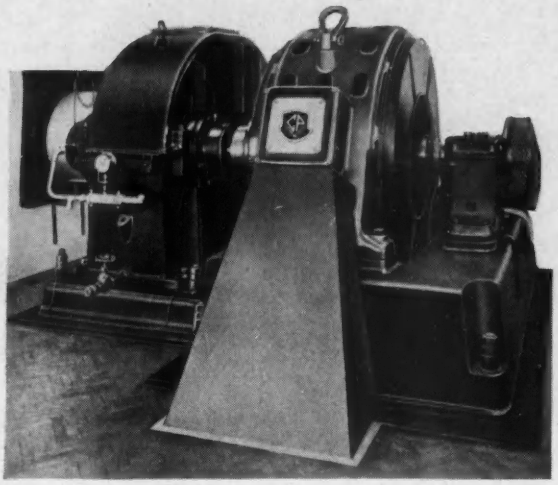


Fig. 4. This 600 kVA alternator is driven through the double helical gear unit on the left

in mind the excellent condition of the steam engine which was installed in 1929 and the steam raising plant needed for process work, it became apparent that the form of operation providing the best overall economy would be that employing an alternator, an alternative supply of 100 kVA from the Y.E.B. to be used as a standby, when certain departments were required to work overtime or when a night shift was in operation.

Changeover Programme

The changeover work was put in the hands of the Contract Department of Crompton Parkinson Limited, who it is of particular interest to note, made a specific point of effecting the work in a way that would ensure the minimum of interference with production. The main switchboard and the foundations for the main alternator were laid down before the mill closed for its annual week's holiday. All cabling and wiring necessary and the fixing of many of the motor and motor starters was also affected during working hours—without in any way hindering output. Then, when the mill had closed down for the holiday period, the 600 kVA, 440 V Crompton Parkinson alternator was installed (see Fig. 4) and the changeover of one complete section of the mill (there are two sections) was completed, the remaining section of the mill being changed over step by step later on whenever convenient from the point of view of causing least upset to production.

To obtain the operating speed required, the steam engine was arranged to drive the 750 r.p.m. alternator through a double increasing helical gear unit. The bearings of this gear unit are pressure fed, and as a safety measure, the unit is fitted with oil temperature indicators arranged to give an alarm at a pre-determined temperature. The supply of steam is automatically shut off at a somewhat higher maximum safety temperature.

The output from the alternator is taken to a Crompton Parkinson switchboard through the main oil circuit-breaker which is of the hand-operated pattern. Duplicate busbars were provided, of course, on the switchboard, the top set for the alternator supply, and the bottom set for the Yorkshire Electricity Board supply, and provision was made for twelve outgoing feeders to supply the different departments of the mill.

In all, the changeover work involved the installation of from seventy to eighty motors of from ½ to 85 h.p. but before attempting to ascertain the extent of the modernisation programme in the mill, it should be remembered that some of the more recently installed machines were already driven by individual motors. In the weaving sheds, for example, the Northrop automatic looms introduced in 1951 were already fitted with individual drives. The old looms which dated from about 1890 were re-arranged for group drives by electric motors.

Motor Drives

In general, Crompton Parkinson "Klosd" (totally enclosed fan-cooled) motors are used in the mill wherever there would be a likelihood of fly and dirt entering screen protected motors. Fig. 3 shows a rag pulling machine driven by a 37·5 h.p. "Klosd" motor. A similar motor (on the left) drives the suction fan which delivers the pulled material to the packing room. Fig. 2 shows the drive of the willey used for preparatory processing of the different grades of recovered fibre for blending. Two drives are required for the willey, so again making use of existing

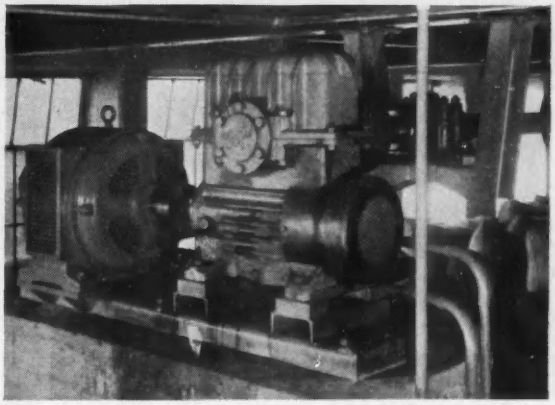


Fig. 5. Close-up of a drive for a line shaft in the milling department. This operates through the worm reduction gear shown in the foreground

arrangements whenever practicable, a part of the old drive shafting was retained to enable only one motor to be employed instead of two. This motor, as can be seen in the illustration, was specially mounted on suitable brackets attached to the walls.

In Fig. 5 can be seen the motor driven line shaft equipment for the milling department, while in Fig. 1, the motor driving the scribbling and carding machines is shown. In the latter illustration, taken from the condensing end of the plant, it may be noted that the motor is conveniently mounted on an extension to the stanchion, this arrangement not only saving floor space but enabling, again, the existing drives to be employed usefully.

Modified Modernisation

As will have been gathered, the modernisation programme was not a matter of scrapping all old plant and installing entirely new equipment throughout, but rather based on a carefully thought-out plan whereby the best of existing plant has been retained wherever practicable and then improved by introducing the latest methods of power supply and plant usage. This method of modernisation offers many advantages. That greater flexibility of plant control, improved production and greater output, cleaner working conditions and a higher degree of safety for the operatives, can be so achieved, is apparent.

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Earthing

IT has been found from time to time that the "earth" connection for an electrical installation, has been removed during alterations to pipes or systems, and has never been replaced. This obviously leaves a dangerous state of affairs. This happens more frequently in domestic installations, and I feel that all installations (electrical) on domestic premises should be thoroughly inspected periodically. This is frequently and generally done in most factories and schools.

J. H. Robinson,
THORNTON, FIFE.

Scottish Electricity

METEOR'S comment of 22nd July on the latest decisions on the future control of Southern Scottish electricity gives one of the few—if not the first—public warnings on the possibility of redundancy occurring amongst present employees arising from the forthcoming reorganisation.

It is significant that since the nationalisation of the industry in 1948, Lord Citrine has been most outspoken in assuring all employed by the B.E.A. and Area Boards that they could have no fear of becoming redundant as a result of changes in the industry as there was work for all for many years to come and if the aim of electricity for all was to be achieved it was a target which must create further employment in all branches of electricity supply and the industry as a whole.

Assurances of this sort combined with better employment conditions arising out of nationalisation (particularly in Scotland), undoubtedly gave added confidence to many engaged in the industry to take every opportunity for advancement by "moving around." Englishmen and others even left their native lands to take up positions in Scotland! But would these same enthusiasts have left their English (or Welsh) employment if they had been aware that within quite a short space of time they were to become ensnared by a sop to Scottish Nationalism?

Little, if anything, in the nature of assurance of continued employment to those at present engaged by the Scottish Boards has been given in the various parliamentary debates on the Scottish Bill. Note, however, that in the debate prior to the third reading the Secretary of State for Scotland is quoted by a prominent Scottish newspaper as saying "We believe in the Bill because we believe in decentralisation. We are having a closer contact with the consumer to see his needs are paid attention to, by taking it out of the hands of the British Electricity Authority and the Ministry of Fuel and Power, and managing it in Scotland by Scotsmen." (Quoted in *The Scotsman* in the report from the Parliamentary correspondent, 13th July issue.)

Do his final words ring the death knell for those who deigned to trespass on Scottish soil?

The Secretary of State himself will be swallowing his claymore if it should come to his knowledge that much of the donkey work in the organisation and development of the present Boards has been in the hands of emigrants from south of his border, as can be verified by reference to relevant publications and time to time notices in the personal columns of your own and your contemporaries' journals. There are also recorded (admittedly it is almost unbelievable) cases of Scotsmen leaving their Sassenach colleagues and returning to their native heaths. But don't forget that under the improved conditions of nationalisation their return would not be at their own expense!

Reverting again to the interlopers however, supposing they are not prepared to give allegiance to a Scottish nationalist enterprise. Will the English and Welsh members of the British Government come to their rescue and assure them of safe transit back across the border and a continuation of employment with the C.E.A., the English or Welsh Boards? Or is the Government going to deal with this minority problem as one of its predecessors did in 1938 with Czechoslovakia?

Our constitution appears to rule out the intervention by the Foreign Secretary but neither he nor the Prime Minister can deny that, in their party's manifesto at the last election, they assured Scotland of independence as far as electricity supply was concerned. By doing so they have deserted (maybe unwittingly) a minority of their countrymen and left them to the wolves!

Take heed all you deserters of the rose and the daffodil that, unless this problem is resolved and your future interests safeguarded, from all fool's day next year if any bombs are discovered at the bases of Scottish pylons it's not the Scottish Nationalists who will be blamed—it's you!

Mac Surrey,
NORTH BRITAIN.

Fair Trading Policy Definitions

THE objects of the Fair Trading Policy include, amongst other important considerations, the definition of functions of the various sections of the Industry, and to ensure that the needs of the Industry are adequately reflected therein, the Policy is kept constantly under review.

As an outcome of recent deliberations the Electrical Fair Trading Council has agreed that the time is opportune to make amendments in respect of two definitions.

The definition of an "Electrical Contractor" has been amplified as below, as correctly representing current conditions for incorporation in the Policy in due course:

> "The term 'Electrical Contractor' means any person or persons, company or firm or department thereof, with suitable premises and the necessary equipment, principally engaged in the business of installing and selling electrical products, employing either as principal or operative, a person or persons having served a recognised electrical apprenticeship or in possession of other equivalent qualifications."

In a technical industry it is undoubtedly desirable that its channels of distribution should be through outlets possessing skilled staff and be able to accept responsibility for "after sales" service which may be incurred on the electrical products handled. The definition of "Electrical Retailer" has therefore been strengthened accordingly to read as below and is being incorporated in the Policy forthwith:

> "The term 'Electrical Retailer' means any person or persons, company or firm with shop or showroom premises and equipment suitable for a retail trade or equivalent facilities for resale, who carries a reasonable stock of electrical products and accepts responsibility for after sales service for such products."

Printed amendment slips for insertion into the Policy, in respect of the "Electrical Retailer" definition will shortly be available and application should be made to the Secretary of the Electrical Fair Trading Council.

From an engineer's notebook

I HAVE never taken kindly to the subject of interference suppression: psychologists would probably deduce therefrom some early association with overhead lines and the Post Office. In those days it was argued that as telephones were first in the field, it was right and proper for those new boys, the overhead power circuits, to be saddled with the task of preventing interference. But when, later, broadcasting became a universal time wasting occupation, the power engineer was still held to be in the wrong by his light current brother. So whether we think it fair or not, whether we think the radio engineer ought to solve his own signal/noise problems, it is the power engineer who remains saddled with the responsibility. Usually, with a bit of co-operation between the two, however, wonders can be worked. I have just been reading of an example of such a combined operation in Sweden where trouble with interference from the 220 and 380 kV lines has been experienced in certain local districts. The solution adopted is the delightfully obvious one of raising the signal/noise ratio by using the local power lines themselves as a broadcasting aerial. Of course, it is not quite as simple as it sounds. There are the complications of blocking condensers, tuned rejectors and the like which we meet in carrier current protection. Tests, however, show the method to be successful but as the degree of damping increases with the frequency to a greater extent than the effective reduction in reception of interference, the long wave band is selected for choice of wave length. Original experiments were made with a 100 W transmitter and now sets up to 2 kW which should each cover some hundreds of kilometers of line are being stalled.

* * *

SO much is heard of the wonders of our modern digital computors, of the electronic brains as they are called in the press, that we are apt to forget that not all scientific research is so glamorous. Let me administer a corrective and talk of some of the humdrum activities of research workers, in fact nothing more exciting than the counting of particles and how by ingenuity some of the drudgery can be reduced. The first is a simple case of counting virus spots on a leaf, which may be any number up to one thousand or more. And simple too was the solution. A sheet of conducting glass was used, illuminated from behind, on which the leaf was placed. Then, with the use of a pointed probe connected to a battery, through a counter to the conducting surface of the glass, each spot could be automatically counted by pricking, while the hole punched in the leaf was clearly illuminated to prevent it being counted twice. From this neat labour-saving device I can pass to a far more scientific proposition, the automatic counting of small particles and the determination of their average size by photo-electric scanning. In one form, the sample to be counted is placed between two plate glass discs and is spirally scanned by a photo-electric scanning head so that as each particle is reached, a pulse will be generated which can be automatically counted. When the particle is small relative to the beam width the resulting pulse will not reach the full amplitude, while with much larger particles pulses will be generated on successive scan tracks. By adjusting the amplitude level of the pulses at which the counter operates, successive counts can be obtained, and for given scanning parameters, the numbers recorded can be shown mathematically to be a factor of the average diameter of the particles being counted. Therefore by making a number of tests at different pulse amplitudes and plotting the results graphically, the number of particles and their average size to reasonably accurate values can be determined by a simple geometric construction. Surely this is a delightful technique for a very mundane task.

* * *

FROM time to time we read in the general press of the wonders of the application of electricity to medicine, of bloodless surgery, of that unpronouncable instrument that measures brain waves, of the artificial lung and now of the artificial heart. So if I may indulge in the macabre for once, it may be of interest to describe an electrically powered device that was recently used to permit a patient's heart to be drained of blood during a delicate operation on that vital organ. The pumping unit, simple if uninspiring in design, consisted of plastic tubing arranged in an arc with a metal roller revolving on it, to squeeze the venal blood from the patient to artificial lungs. These were composed of two plastic plates separated by a thin wire grid over which the blood flowed, at the same time oxygen was blown between the plates to effect the interchange with carbon dioxide in the blood stream. The resulting purified blood was then pumped back to the patient's arteries by a similar tubular pump. The inevitable electronic gear makes its appearance in the form of control equipment to ensure that the personal rhythms are maintained and the whole device seems to have worked satisfactorily for twenty-six minutes, the period of the operation. The prospect of changing over a person's system of circulation to such a device must surely give any control room engineer the shudders and at the end of this most spectacular achievement one cannot help wondering how much better nature herself does the job.

* * *

READERS of these notes will, I am sure, be familiar with the technique of printed circuits, whereby a resistant film is printed on a metal foil and the unwanted metal etched away. Now our mechanical friends are taking a leaf out of our own book and have introduced a similar idea under the name of chemical milling. It is intended for the production of intricate parts where those surfaces to be machined are left unprotected and etched in a special bath. The method is claimed to be faster and cheaper than mechanical methods. It does not give rise to any distortion on light parts and accuracies to 0·002 in. are said to be obtained.—*E.R.G.*

Power for a Steelworks

High-Voltage Distribution at Lackenby Site

IN 1946, Dorman Long and Co. purchased the whole of the land between the Cleveland and Redcar Works, an area of 680 acres. On this site, known as the Lackenby site, has now been built an open hearth steel furnace plant, and alongside this is shortly to be constructed a new combined universal beam and structural mill, while at the Cleveland end of the site plans are in hand for a medium section mill and a rod and bar mill.

Although estimates showed that the maximum demand for electric power on the plant would only be in the region of 1,500 kW, it was decided that in view of the future extensions, a supply system should be provided which would link up with the distribution system on the adjacent Cleveland and Redcar Works.

This scheme is shown diagrammatically in Fig. 1. The system begins at a new 11 kV substation constructed adjacent to the North Eastern Electricity Board's 66 kV substation at Grangetown, with the necessary switchgear, reactors and ancillary equipment to give an automatic duplicate supply of 10 MVA at 11 kV. The reactors in the Board's incoming feeders are of the cast-in-concrete type and are designed for a throughput of 15 MVA. A reactance of 10·5% each was necessary to keep the short-circuit rupturing capacity of the system below 350 MVA.

From the substation, two feeders, each 0·25 sq in. 3-core with associated pilot and telephone cables, were laid to the 11 kV switchboard in Lackenby power station, and between Lackenby and Redcar Works, a total distance of 3½ miles. The feeds are equipped with Solkor and back-up overcurrent protection to give instantaneous isolation from the system in the event of a feeder fault.

Inside the Lackenby Works a primary distribution network at 11 kV has been established, with a secondary network at 2,750 V and a tertiary network at 440 V. A crane supply at 250 V d.c. has been introduced as high acceleration and heavy duty working is essential. The distribution system is shown diagrammatically in Fig. 2, endeavours as far as possible to give duplicate supplies to all essential plant.

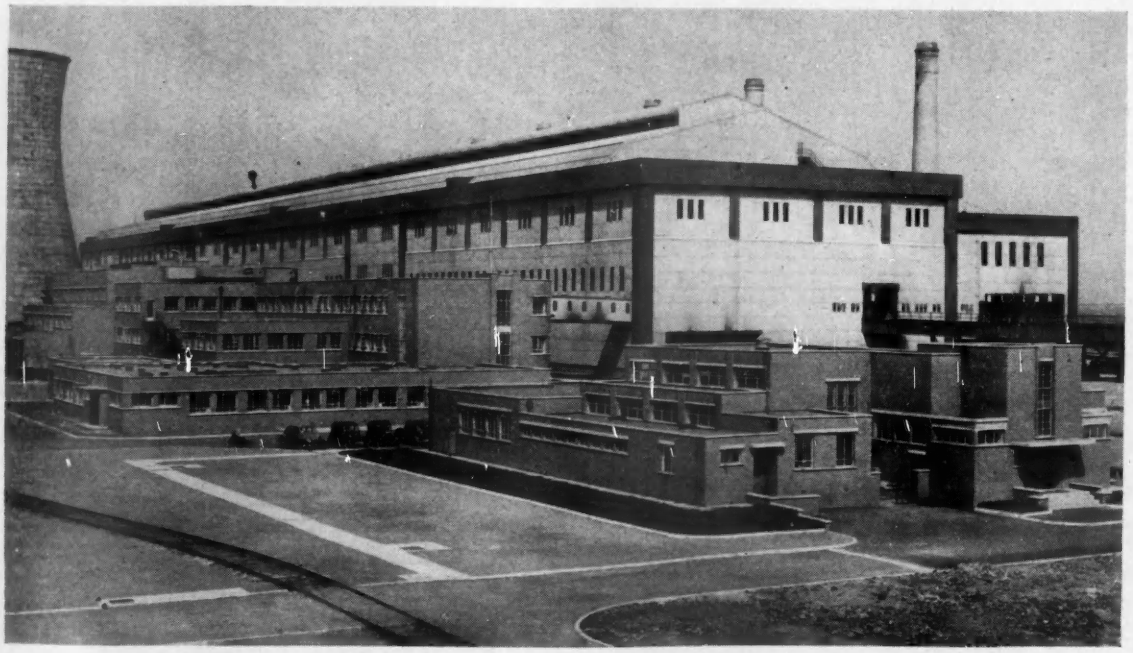
The 11 kV switchgear is located at the Lackenby power station which houses a 5 MW turbo-alternator, and the furnace cooling water pumps. In the same building are one of the three main power transformers, switchgear for the 2,750 V and 440 V systems, and the rectifying equipment and switchgear required for the 230 V supply to the overhead cranes in the melting shop. Three other substations have been provided at each of which power at a pressure of 11 kV is transformed down to the voltages required in the area served by the substation.

Transformers and Rectifiers

The three main power transformers are all of 3,500 kVA capacity, and are of the 3-winding type, giving an output on the secondary side of 2,500 kVA at 2,750 V and 1,250 kVA at 440 V.

The transformers have off-load tapping switches giving ±2½ and ±5%. In the engineering shops is a 1,000 kVA capacity 11 kV/440 V transformer.

Direct current for the melting shop cranes is provided



General view of the new works showing the power house and administrative offices in the foreground

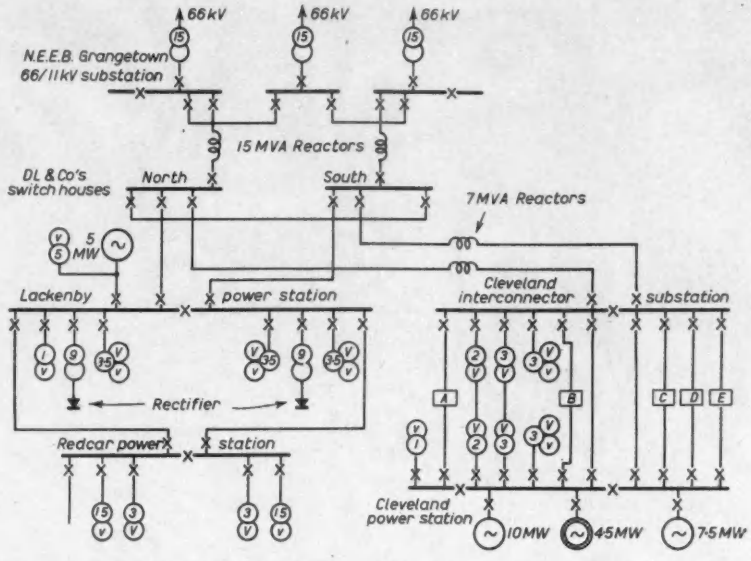


Fig. 1. This drawing is a schematic diagram of the main 11 kV system. The transformers are conventionally represented, except that their capacity in kVA is indicated in one of the circles, while the secondary voltages are indicated by V (2,750 volts) and v (440) volts. The letters in the rectangular boxes are A—ore plant; B—coke ovens; C—Fourteen-inch mill; D—Forty-inch mill; and C—No 6 mill

by two 600 kW banks of rectifiers, each bank comprising two, 300 kW side-anode type, pumpless steel tank rectifiers fitted on trucks which can be withdrawn for maintenance from the steel cubicles. Each bank is supplied from a 900 kW 6-phase transformer, the extra capacity allowing for the addition of a further 300 kW unit to each bank if the d.c. load increases sufficiently in the future to require it.

For the overhead cranes in the stripper building, there are two 300 kW rectifiers, each supplied from a 6-phase transformer with an input pressure of 440 V, 3-phase. The 11 kV switchgear supplying the rectifier transformers are equipped with time-lagged overload and earth fault protection, and instantaneous overload for protection on backfiring.

Switchgear

The 11 kV switchgear comprises a 12-panel board of 800 amp oil circuit-breakers. They are solenoid operated, either from the control room on the turbine floor, or locally from the switch. In order to make adequate provision for the future growth of the system, the switchgear, although of 350 MVA rupturing capacity has frame stands, bus chambers and back portions designed for 500 MVA. Short-circuit capacity of the 2,750 V switchgear is 75 MVA, and the gear consists of air insulated 800 and 400 amp oil circuit-breakers with vertical isolation.

For the 440 V system, air-break switchgear was chosen in preference to oil break, because of the former's advantages in reduced fire risk, better appearance and compactness. No feeder earth leakage protection is fitted, but equipment has been added to enable earth leakage current to be measured.

On the 230 V d.c. system, the switchgear for incoming supplies from the rectifiers comprises 4,000 amp, double-pole, hand-operated air circuit-breakers, with instantaneous reverse current trip and direct acting time-lagged overload. For outgoing circuits 2,000, 1,000 and 500 amp double pole breakers are fitted. Because both poles are insulated, earth leakage lamps, together with a milliammeter, indicate and measure the resistance of either pole to earth.

On the desk of the control engineer in the power station is a 25-unit facia type miniature alarm panel which gives a warning in the event of faulty operation of any of the primary and secondary switchgear or rectifier equipment. A contact, which closes at the faulty unit causes an alarm

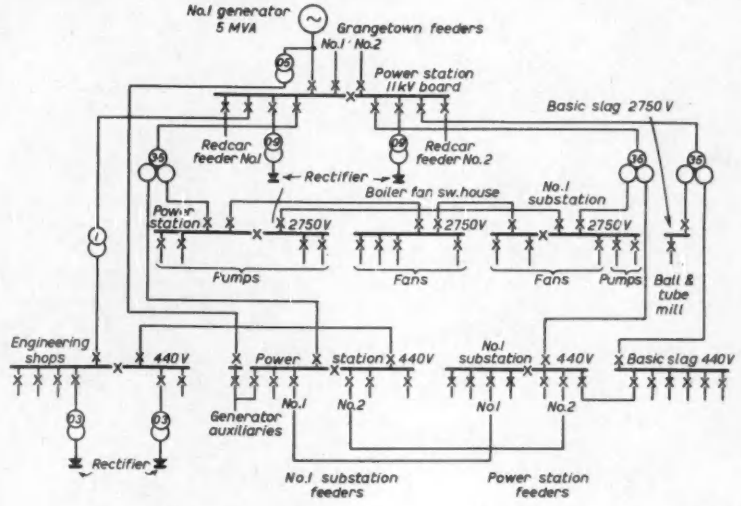


Fig. 2. In this diagram is shown the internal arrangement of the works 11 kV, 2,750 volt and 440 volt circuits. It will be seen that the major loads of fans and pumps are supplied at 2,750 volts. As in the diagram above, the transformer capacity in kVA is indicated in one of the circles

The excellence of the illumination provided can be seen in this photograph of the working level in one of the buildings. The picture shows a Babcock and Wilcox charger in operation inserting scrap into one of the furnaces

bell to ring in the control room and flashes the appropriate lamp on the miniature board.

All three-core cables are paper insulated, single wire armoured, hessian taped and compounded. The 11 kV cables are of 0·15 sq in. section and the 2,750 V cables have a section of 0·25 sq in. for feeder and transformer connections and 0·04 sq in. for connections to motors which are started direct-on-line. Cables for 440 V range from 0·3 sq in. to 0·0045 sq in. and are p.i.l.c.s.w.a. For lighting and small a.c. power drives, extensive use has been made of mineral insulated, copper sheathed cable. Cranes subject to excessive heat are wired in varnished cambric, asbestos covered or polychloroprene sheathed cable carried in steel trunking or conduit.

For the d.c. feeder cables and other cables following the same route from the power station to the melting shop, aluminium sheathed cable has been used.

Motor Drives

On all production cranes the motors are series wound, and of the new A.I.S.E. standard 600 range. The new motor has two main advantages over the older 400 range. It has a smaller armature inertia, resulting in shorter reversal times, better thermal efficiency and higher safe speed. Cranes for maintenance duties are fitted generally with industrial d.c. crane type motors, series wound.

For all drives, other than cranes, and for cranes which are too far from the main d.c. load centre to warrant running supply cables, a.c. motors are used from the 2,750 V supply for powers over 100 h.p. and from the 440 V system for smaller motors. The 2,750 V machines driving pumps and fans, are direct-on-line started, with a starting current of four and a half times full load current.

Lighting

In all the main buildings the lighting has been designed to give an average intensity of illumination of 6 lumens/sq ft after allowing for a 5% fall in output due to dirt and depreciation of the lamps.

In three bays of the melting shop, mercury vapour lamps alternate with tungsten filament lamps. The mercury vapour lamps are 1,000 W, 440 V and give a light output of 48,000 lumens, while the tungsten lamps are 1,500 W, 250 V giving 28,000 lumens. All the lamps are housed in anodised aluminium reflectors with side vents to give cooling and some upward light. To supplement the light on the casting bay floor, angle reflectors, housing 1,000 W tungsten lamps are provided on the crane access gangway opposite the furnaces. Maintenance shops and other ancillary buildings are equipped with vitreous enamel reflectors, each housing a 750 W tungsten and a 400 W mercury vapour lamp, spaced to give an average intensity on the floor of 6-10 lumens/sq ft.

Lighting of railway sidings is given by clusters of lamps on six steel masts 150 ft high. Each mast has a platform 8 ft square designed to accommodate forty-eight 1,000 W tungsten filament floodlights.

Works Output

The Lackenby open hearth works has five 360 ton basic open hearth tilting furnaces and two 600 ton active mixers. These are supplied with molten iron from both Cleveland and Redcar Works along internal lines. The railways on the plant must handle over 25,000 tons per week of incoming scrap, raw materials, outgoing ingots and works ballast. The steel plant is designed to produce 625,000 tons of steel ingots per year but sufficient space is available to extend the melting shop to give an annual output of about 900,000 tons. Length of the main building is 1,084 ft long and 232 ft wide and contains three parallel crane bays for the casting cranes, the furnace charging machines and the stockbay cranes. The stripper building where the ingots are removed from the moulds is 280 ft long with a crane gantry extended 245 ft outside the building. The 5,000 kW turbo-alternator in the powerhouse generates at 11 kV and is powered by steam from waste heat boilers at each furnace and mixer. Other buildings include a special building for handling and preparing raw materials other than pig-iron, scrap and scale, a machine shop, electrician's shop and boiler shop and a wagon repair shop.

ELECTRICAL CONTRACTORS

Crane Motors and 440 V switchgear	Metropolitan Vickers Elec. Co., Ltd.
Switchgear (11 kV)	A. Reyrolle and Co., Ltd.
Motors, reactors, lighting, rectifiers	British Thomson-Houston Ltd.
Fan motors, transformers, crane motors	Bruce Peebles and Co.
Cable installation	British Insulated Callender's Cables.
Transformers	C. A. Parsons and Co.
Rectifiers, motors, lighting, turbo-alternator	General Electric Co.
Switchgear (2,750 V)	Brush Elec. Engineering Co.
Crane control gear, motor starters	Allen West Ltd.
Motors	English Electric Co., Ltd.
Control gear	Contactor Switchgear.
Crane control gear	Igranic Electric Co., Ltd.
Switchgear (440 V)	Switchgear and Cowans.
Mineral insulated cables	Pyrotenax Ltd.
Telephone installation	Standard Telephones and Cables.

What the Regulations Mean

NEW INTERPRETATIONS BY I.E.E. WIRING REGULATIONS COMMITTEE

PREPARATION of a new edition of the Wiring Regulations does not conclude the Institution's interest in that famous code. From time to time, the Committee responsible prepares answers to specific queries regarding interpretation. Naturally, some of these queries are of general application, and this week the Institution has for the second time issued a collection of interpretations applying to the twelfth edition of the Regulations.

In this article it is the interpretations concerning the ring circuit that are summarised. It is hoped next week to give another selection of interpretations on other Regulations.

In dealing with ring circuits, other parts of Regulation 201 "Connection of Final Sub-circuits" may be considered. The first relevant interpretation relates to 201, 202 and 313, and relates to bunching and looping more than one wire or cable of an outgoing final sub-circuit at a fuse-way. The decision is, that there is no prohibition of this. The protecting fuse must have a current rating not exceeding that of the smallest cable (202) and the fuse terminal must be of adequate size and mechanically suitable for its duty (313).

In a small domestic premises using a ring circuit, it may be desired to make a clock-connection at the mantelpiece. Accommodating a 13 amp socket-outlet may be difficult: may a small clock connector, connected on a spur, be used? The answer given is, that the additional load presented to any final sub-circuit by an electric clock connected by means of a fused clock-connector or a socket-outlet with plug fused at 3 amp may normally be disregarded. Thus the connector may be looped into a 5 amp or 15 amp sub-circuit (201 B) providing the cable has a rating as great as that of the fuse protecting the sub-circuit. Where a ring-circuit is used, a clock may be connected by a plug containing a 3 amp fuse, to a BS 1363 socket-outlet or else a spur of 7/·069 in. conductors feeding a clock connector may be used. The latter is preferred, provided the connector terminals are large enough.

Another question on looping requests permission to loop a 5 amp socket-outlet by means of 7/·029 in. cable through a 5 amp cartridge fuse from a 15 amp final sub-circuit which already supplies a 15 amp socket-outlet. The answer is that Reg. 201 (B) imposes no limit to the number of points fed by a final sub-circuit rated at 15 amp. It may be possible to take diversity into account (202 D), while 202 F may apply and 202 E will. It should be borne in mind that 201 C, Exemption (i) provides an alternative arrangement.

Appliances on Ring Circuits

Questions have arisen from time to time concerning the meaning of the term "fixed appliances" which is used in Reg. 201 D. It is stated in reply to a query that the term may only be taken to mean appliances which are not capable of being removed without the use of tools. No explicit reference is made to the mode of connection to the supply. The fact that appliances fixed mechanically are not connected permanently to the wiring (e.g. connection is by a 13 amp fused plug to a socket-outlet) does not affect the application of 201D. It needs to be noted, however, that for every fixed appliance, the permissible number of socket-outlets has to be reduced by one. For a specific case involving the connection of four panel fires and an immersion heater on a 10 socket-outlet ring circuit, the sum of the ratings of all the fixed appliances connected must not exceed 15 amps (201 D).

It is stated that further consideration will be given to this point in the course of the preparation of the 13th Edition of the Regulations.

Regulation 201 C includes the phrase "where the application of a diversity factor can be justified." This has given rise to a query concerning domestic premises where two 13 amp socket-outlets are supplied by a 20 amp switch and fuse in accordance with Regulation 201C, Exemption (i). The intention is to use a 3 kW breakfast cooker and a 3 kW wash boiler from these socket-outlets. Does the application of diversity bring the total loading within the capacity of the switch and the 7/·029 in. cable?

The answer given is, that the applications of Exemptions (i) to (iv) of 210 C is always allowable for domestic premises. In the example quoted, however, it might be good practice to provide separate sub-circuits for the appliances.

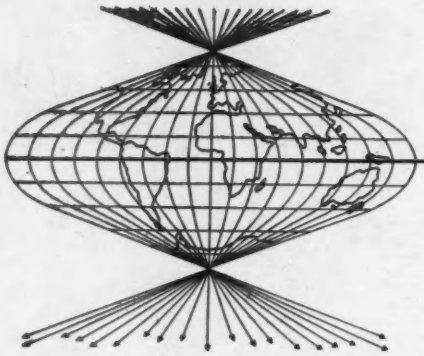
Ring Details

Regulation 201 C, Exemption (iii) refers to ". . . a ring both ends of which are brought into the terminal of a fuse having a rating not exceeding 30 amps. . . ." This gives rise to the question, does the ring have to be brought into physical connection with the terminal, or is the requirement rather that they should be brought into satisfactory electrical connection with it? As a specific question, would it be permissible to connect a ring circuit by means of an existing 30 amp cable (7/·044) to an existing 30 amp switch and fuse? The answer is, that such an arrangement would not satisfy Regulation 201 C. A 30 amp fuse would have to be placed at the point of connection of a ring circuit to the existing run of 7/·044 cable mentioned.

Dual socket-outlets, 13 and 5 amp, arranged for connection to a ring circuit are on the market, and the plugs are fused appropriately. It is stated, however, that the exemptions to Regulation 201 C are expressly restricted to the circuits and conditions described. The fused plugs and shuttered socket-outlets must, under Regulation 1312, comply with BS 1363. Thus the arrangement described cannot be used in connection with Regulation 201 C, Exemption (iv), about which there was a specific question.

The final question on 201 C asks if it is permissible under the Regulations to join together the ends of two spurs provided under 201 C, Exemption (iv), thus forming a subsidiary ring. The argument is that if the two socket-outlets of one of the spurs are to be fully loaded to 3 kW simultaneously, it appears wise to spread the load on the cables in this way, although the Regulation does not require it.

It appears, however, that although the interlocking of the spurs, if properly carried out and maintained, may present advantages under some conditions of loading, the arrangement does not comply with Exemption (iv).



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Underwater Line

Work is expected to start about the end of this month on the laying of a high voltage submarine cable on the bed of the St. Lawrence River to transmit power to the Gaspé Peninsular from a new power station of the Quebec Hydro-Electric Commission on the north shore, a distance of 31½ miles. The British cable layer, H.M.T.S. *Monarch*, is to assist in the work, which it is expected will take 3 to 4 weeks to complete. The cable has been made by the Canada Wire and Cable Co. Altogether four lengths are to be laid. Initially, electricity from the Manicouagan Power Co.'s plant will feed the line. But eventually supplies will be given by the Commission's 1,200,000 h.p. Bersimis River hydro-electric plant now under construction and scheduled to have its first 150,000 h.t. generator in operation late in 1956.

Further Expansion

The expenditure of $1 million to expand its power services is being contemplated by the North York Hydro Commission, Ontario. That Commission takes a bulk supply from the Hydro-Electric Power Commission of Ontario. The Ontario Municipal Board has now been asked to approve the construction of four more distribution stations and a repair building for the undertaking. North York Hydro Commission already supplies more than 33,000 consumers, and a further 5,000 will be connected by the end of this year, it is expected. The Commission has taken over distribution in sections of the township previously served by the rural division of the Hydro-Electric Power Commission of Ontario.

Labrador's Vast Power

The possibility of transmitting power generated in Labrador, about 1,000 miles south to Toronto and Ontario, is now being suggested. Survey parties of the British Newfoundland Corporation Ltd., which was set up to develop the territory, are now at work in the locality, around Grand Falls. General A. G. L. McNaughton, Canadian chairman of the International Joint Commission, who has been closely interested in the site for the last 40 years, has said that the project is within economic range and transmission distance of Toronto. Per h.p. it will be the cheapest site in Canada, because of its immense size, and because no large expensive dams would be needed. At the Grand Falls site in mind, a 40 ft dam, would enable a 1,100 ft head to be utilised. The site would have an installed capacity of 5 million or 6 million h.p., or perhaps more, he said, but obviously it would be developed in stages. Among the many British firms concerned in the exploitation are the English Electric Co., Ltd.

Underground Cabling

The Public Utilities Commission of London, Ontario, is planning to spend $80,000 on the provision of additional cable in East London to meet the rapidly expanding demand. In this work, h.v. underground cables are to be utilised to a greater extent to obviate trouble from storms and gales. Another phase of the programme will be undertaken later this summer. It involves the installation of a low-voltage underground network in the east-end business area, similar to the one already operating in the down-town area.

N.S. Plant

The Seaboard Power Co. has ordered a fifth generating set for its Glace Bay, Nova Scotia, steam power station. The new set is to be of 18,750 kW capacity, and is expected to be completed in 1955. A similar set was installed earlier this year. This station provides power for the Cape Breton coal mines and the surrounding district.

EUROPE

Early Commissioning

In Portugal, there has been a pronounced advance in the dates originally fixed for the completion of hydro-electric power stations under the Governmen"'s Development Plan. At the Cabril project, which was scheduled to begin operations in 1955, the first set is already running, as we noted on 10 June—it has cost 500 m. escudos and will have an annual output of 270 m. kWh. The Caniçada project which was also due for completion next year, will be working this year and will add some 200 m. kWh to the nation's power supply. The Bouça power station which will complete the project for utilising waters of the Zezere, is making rapid progress and will begin production in the second half of next year, judging by the present schedule. In the first three years of the Development Plan, the following hydro-electric schemes will have been completed (annual output in millions of kWh in brackets): Salamonde (120); Cabril (270); Caniçada (200); Bouça (135); increase of output in other centres (80). These give a total production increase of 805 m. kWh.

Athens-Piræus Electric Railway

The Greek Co-ordinating Council has approved the text of the agreement between the Minister of Communications and the Hellenic Electric Railway for the extension of this railway to Kifissia and Ekali. It is proposed to extend the railway to Ano Patissia within 10 months, to Nea Ionia within 20 months and to Kifissia in 30 months. The extension from Kifissia to Ekali has not yet been surveyed. The estimated cost of the whole project is $6,000,000, and will be borne entirely by the Hellenic Electric Railway Co. which will also undertake the construction work. The Company will be helped by a loan to be granted to it from the $10,000,000 allocated for industrial credits.

AFRICA

Kampala's Electrical Exhibition

With electricity development in Uganda well under way, the local electrical concerns have now formed an association, among whose aims is the encouragement of the wider use of electricity. With the title of the Uganda Radio and Electrical Association, offices have been set up at P.O. Box 28, Kampala. There are eight founder members of the association. It is intended to hold annual radio and electrical exhibitions and the first of these, claimed to be also the first such show in East Africa, is being planned for Kampala next January. The organisations aim to have every type of radio and domestic appliance on view, with cookery and other demonstrations, in addition to examples of television working on a closed circuit.

A Modern Building

Now nearing completion is Rhodesia's tallest building, Trafalgar Court, which is under construction in Salisbury. Approximately 165 ft high to the survey beacons on top of the water tower, in addition to

60 flats and store rooms, the building will contain 144 all-electric flats. In each of these are to be installed an electric cooker, water heater and refrigerator. The building will contain more than 2,400 electrical points involving over 10 miles of cable. In the basement there is to be a restaurant in the lighting of which fluorescent lamps are to be used.

Egyptian Scheme

A report dealing with the technical details of the project for a power station in South Cairo, which is intended primarily to feed large factories, has been prepared by the Egyptian Ministry of Public Works. In submitting the report to the National Production Council, the Ministry has suggested that it be authorised to place the necessary contracts after inviting tenders. The National Production Council has already approved a credit of £E 6½ millions for building the station. The Gas and Electricity Administration for the city of Cairo consider that that sum will cover the cost of the project, leaving a surplus, and suggests that the latter could be utilised for the installation of overhead lines. Accordingly the Administration suggests that these items be included in the credit so that specifications may be drawn up and tenders invited. In view of the abolition of the Egyptian Purchases Office in London, the Administration has suggested that a credit of £E 20,000 be allocated for conducting the necessary tests over a period of three years and for the delegation of engineers to attend the tests by firms abroad. Another credit of £E 22,000 is needed for training the staff to be responsible for running the station.

S.W. ASIA

Gas for Power?

It is now proposed by the Pakistan Government to run another gas pipeline north of Sui (the natural gas field) to feed a central power station in the South Punjab. This station would meet the power requirements of the contiguous parts of the neighbouring provinces and Bahawalpur. The Pakistan Industrial Development Corporation has been authorised to undertake this work. They have already engaged the Italian firm of Montecatini to prepare a project report, we understand. Earlier, the Minister for Industries, when announcing the extension of the activities of the Development Corporation to include the generation of electricity from natural gas, said that whether the supply of the gas itself or the electric power generated from the gas would be cheaper was a matter for the experts to determine.

Electric Cremation

New Delhi Municipal Committee has sanctioned an estimate of Rs. 1,20,000 for constructing an electric crematorium at the junction of Ridge Rd and Temple Lane. Efforts to share expenses with the Delhi Municipal Committee having failed, New Delhi Committee decided to bear the total cost. The Committee's superintending engineer estimates the total cost at Rs 1,20,000. The operating costs, at an average of five cremations a day, were estimated at Rs. 35,450 annually. On this basis, it was estimated that if the Committee charged Rs. 20 per cremation, there would be a net saving of Rs. 1,050 annually. The Committee, however, decided to charge Rs. 25 per cremation.

AUSTRALIA

Oil-firing Conversion

More than half of the Osborne "B" power house of the Electricity Trust of South Australia is to be converted to oil-burning. Announcing this, Mr F. C. Drew, chairman of the Trust, said that seven of the station's twelve boilers would be converted. The contract had been placed with Babcock and Wilcox (Aust.) Ltd. Mr Drew said that New South Wales coal had been unsatisfactory from the viewpoints of quality, price and delivery. Oil-firing was cheaper and reduced the ash problem. Two boilers would continue to burn Leigh Creek coal and three would burn Newcastle coal. Much of the Leigh Creek coal now being produced, would be needed at the new Port Augusta station which came into commission last month (as we reported on 22 July).

More Plant for N.S.W.

A new 50 MW turbo-generator was put into operation at the Pyrmont power station, the Electricity Commission of New South Wales has announced. This generator is the third 50 MW unit in the new section of the Pyrmont station. The fourth and last unit should be added before next winter. The Commission also reveals that the first 30 MW set at the new power station at Tallawarra, on Lake Illawarra, is now undergoing tests.

Coal Handling Plant Order

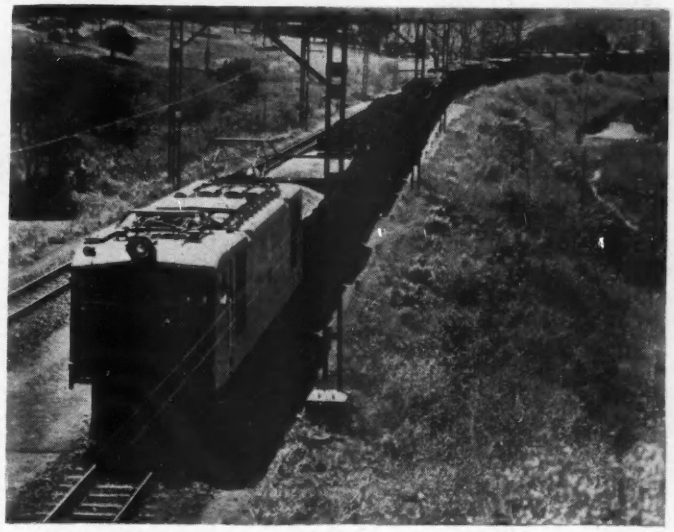
The Western Australian Government has accepted the tender of the Link Belt Co. Pty. Ltd. of Sydney, N.S.W., at £200,594, for the supply of the complete coal handling plant for the new Bunbury power station for the State Electricity Commission. The plant will handle the coal for the new Bunbury power station, for which tenders have been let for three 30,000-kilowatt generators. It will use waggon tippler, crushers and conveyors.

JAPAN

H.E. Scheme

The largest penstock in Japan will shortly be installed at the Yuhara power generation plant of Chugoku Electric Power Company in Hiroshima Prefecture. The penstock, built at the Hiroshima Dockyard of Mitsubishi Shipbuilding Co. at a cost of about Y720 millions, weighs approximately 300 tons and measures about 430 yards in length. The Yuhara plant with a generation capacity of about 50,000 kW, supplies power all over Hiroshima Prefecture.

Goods and passenger trains of the South African Railways are now being handled by electric locomotives ofer the 149 miles of the Cape Town-Johannesburg main line between Bellville, near Cape Town, and Touws River. This section has been electrified at 3,000 V d.c., in conformity with the Natal and Reef electric systems. Work is in hand on converting the existing 1,500 V suburban area electrification between Cape Town and Bellville to the higher voltage. With steam haulage traffic capacity on the Bellville-Touws River section had been limited by the severe gradients and curvature where the line crosses the Hex River Mountains. The new electric locomotives now working this section were supplied by the North British Locomotive Co., Ltd., with electrical equipment by The General Electric Co., Ltd. Having a 1-hour rating of 3,030 h.p., they are among the most powerful yet built for the 3 ft 6in. gauge. When working from Bellville to Touws River they have to negotiate some 15 miles with an average adverse gradient of 1 in 50 and a maximum of 1 in 40. The locomotives are carried on two three-axle motor bogies from each of which a single-axle guiding pony truck is pivoted. Forty locomotives were ordered, of which 30 will operate on the Touws River line.



Personalities

IN THE INDUSTRY

Formerly second assistant engineer (civil) in the Generation Construction Department of the South Western Division of the B.E.A., **Mr F. W. Aries,** A.M.INST.C.E., has been appointed senior assistant engineer (civil) in that department with effect from 1 Aug.

Mr A. V. Summers, ASSOC.I.E.E., chairman of Milliwatt Ltd, sailed recently in the *Corinthic* for a business visit to New Zealand. He expects to be away about three months.

The resignation of the **Rt Hon Oliver Lyttleton,** P.C., D.S.O., M.C., M.P., from the post of Secretary of State for the Colonies, was announced on Wednesday of last week. It has been suggested that he plans to return to his business career—he was chairman of Associated Electrical Industries, prior to Nov. 1951.

Among the Government changes announced on Wednesday of last week, **Mr A. T. Lennox-Boyd** has relinquished the post of Minister of Transport and Civil Aviation, to take Mr Oliver Lyttelton's place as Secretary of State for the Colonies. The new Minister of Transport and Civil Aviation is **Mr John Boyd-Carpenter.**

Mr C. J. Barker has been appointed general managing director of the Wellman Smith Owen Engineering Corporation Ltd, and **Mr F. H. Brooks** has been appointed managing director in charge of production and technical development. Mr Barker was formerly joint managing director and Mr Brooks was previously technical director.

Deputy superintendent at Huncoat power station since 1952, **Mr E. B. Thorpe** has accepted the appointment of station superintendent at the new Fleetwood power station now under construction for the North West, Merseyside and North Wales Division of the B.E.A. The effective date of the appointment has yet to be arranged. Mr Thorpe, who is 41 years of age, has served in many capacities since entering the Supply Industry in 1930 as test department apprentice with the Huddersfield Corporation Electricity Department. From 1937 to 1950 he worked at various power stations including Kearsley, Radcliffe and Padiham. In 1950 he became operation engineer with Simon-Carves Ltd., engaged on commissioning and operating new boiler plant.

Mr W. H. Trim has been designated sales and administrative director of Associated Rubber (Proprietary) Ltd of Melbourne, in which Redfern's Rubber Works Ltd, jointly with the Empire Rubber Co., have an interest. Mr Trim will relinquish his positions with Rubberlines (Hyde) Ltd and Redfern's Rubber Works Ltd., and leave for Australia later this year.

Mr L. C. Southcott, special director and the chief engineer of the Superheater Co., Ltd, has been appointed a director of the company.

Divisional technical engineer with the Southern Division of the B.E.A. since 1948, **Mr E. W. Connon,** B.SC.(ENG.), M.ENG A.M.I.MECH.E., M.I.E.E., has been appointed to the new post of Divisional Electrical Engineer of the North West, Merseyside and North Wales Division of the B.E.A. Educated at Aberdeen Grammar School and the Universities of Aberdeen and Liverpool, he spent six years with the English Electric Co., commencing as a graduate apprentice, and when he left in 1936 he was engineer in charge of their Research Laboratory. From the English Electric Co. he became electrical testing engineer to the North West Midlands Joint Electricity Authority and in 1944 when he was their technical assistant he joined the Sheffield Corporation Electricity Department as chief technical assistant.

After fifty-one years continuous service with the British Thomson-Houston, **Mr Philip H. Goddard** retired at the end of July. Mr Goddard joined B.T.H. in Aug. 1903, and after working in the Wiring Dept., Power House and Motor Factory, started a six-year course in the Test Dept. In 1913 he joined what was then known as the Supply Dept., later becoming power engineer first at Newcastle-upon-Tyne district office and later Cardiff district office. Subsequently he returned to Rugby and joined the Industrial Motor Sales Dept., specialising in the application of electric drives to waterworks and pumping plants. He was chairman of the Rugby Corporation Electricity Committee for six years, up till 1947, and also served on the Executive of the I.M.E.A.

Mr Brian Colquhoun, B.SC(ENG.), M.INST.C.E., M.I.STRUCT.E., M.SOC.C.E. (FRANCE), senior partner in the consulting engineering firm of Brian Colquhoun and Partners, has been appointed engineering adviser to the International Bank for Reconstruction and Development. He has been seconded by his firm for the two years of his appointment, which he will take up, at the headquarters in Washington, in the latter part of next month. Mr Colquhoun will be dealing with large engineering and hydro-electric projects for South America, Mexico, India and Central Africa, we understand.

In a written answer in the House of Commons last Thursday, Mr J. Stuart, Secretary of State for Scotland, announced that if the Electricity Re-organisation (Scotland) Bill becomes law in substantially its present form, it is his intention to appoint **Mr J. S. Pickles,** B.SC., M.I.E.E., the present chairman of the South West Scotland Electricity Board, and **Sir Norman Duke,** K.B.E., C.B., D.S.O., M.C., the chairman of the South East Scotland Electricity Board, to be chairman and deputy chairman respectively, of the new Board. He was not in a position at present to make any

Mr E. B. Thorpe

Mr E. W. Connon

Mr P. H. Goddard

Mr J. S. Pickles

Sir Norman Duke

statement about the other members. Mr Pickles became chairman of the South West Scotland Electricity Board on its formation. In December 1951, he took up a similar post to the Yorkshire Electricity Board, but in the following February, at Mr Pickles' request, the Minister of Fuel and Power allowed him to return to the South West Scotland Board for "purely personal and private reasons" —and there he has remained. Mr Pickles was a member of the Central Authority in 1948-9. Well known for his brilliant initiative and commendable business acumen in handling electricity supply undertakings, Mr Pickles was county electrical engineer for Dumfriesshire from 1931 to 1948. There, he carried out an outstanding scheme of rural electrification. Sir Norman Duke, who has been chairman of the South East Scotland Electricity Board since its formation, was previously secretary of the Scottish Home Department from January 1946, in which capacity he was closely associated with the work of the North of Scotland Hydro-Electric Board. Sir Norman joined the Scottish office in 1919, becoming the first secretary of the Scottish Home Department in 1939, and afterwards served in other Departments during the war.

Mr John Hilton and **Mr C. D. H. Webb** have been appointed executive directors of the Plessey Company Ltd. Mr Hilton who was formerly chief engineer of the Hoffman group of companies and director of Hoffman Tweedales, joined the Plessey Company in 1949, and was appointed general manager of the aircraft mechanical division in 1951. Mr Webb, who is general manager of the aircraft electrical division, joined the Plessey Company in 1939 as senior design engineer. He was appointed general manager of the division in 1947, and later a director of Plessey (Northern Ireland).

Mr J. F. Lockwood, of Henry Simon Ltd, has been offered the post of deputy-chairman of Electric and Musical Industries Ltd. In a statement last Thursday, Henry Simon Ltd, said that in view of the national importance of the post they had advised him to accept it, and would accordingly release him from full-time executive work. Mr Lockwood will remain a director of Henry Simon Ltd. Lord Simon of Wythenshawe has agreed to resume from October his former position as chairman of Henry Simon Ltd.

To succeed **Mr H. J. Mellowes,** F.C.I.S., F.A.C.C.A., who is retiring in October from his position of chief accountant of the London Electricity Board, after 43 years in the Electricity Supply Industry, (as we have already recorded), **Mr A. N. Todd,** A.C.A., is to be the Board's new chief accountant. Mr. Todd is at present assistant chief accountant with the British Electricity Authority.

Mr G. S. Steven has been appointed deputy managing director of Allied Ironfounders Ltd.

Mr G. P. Bridges, A.M.INST.C.E., L.R.I.B.A., M.I.STRUCT.E., manager of the Building Department of Simon-Carves Ltd, has been appointed a director of the company.

G. W. B. Furnaces Ltd, have appointed **Mr T. G. Smith** as outside representative in the Control Gear Division, covering the counties of Yorkshire, Nottinghamshire, Derbyshire and Lincolnshire.

Mr N. F. Patterson has been appointed a director of Monsanto Chemicals Ltd. He joined the firm in 1946, became works manager at Ruabon in 1947, and in July 1949 was appointed general manager of production.

New directors have been appointed to the boards of Austinlite Ltd and Sumo Pumps Ltd, the two English subsidiaries of Stone-Chance Ltd, a new company incorporated last May and itself a subsidiary of J. Stone and Co. (Holdings) Ltd. The directors of Austinlite Ltd are now **Mr John Raymond, Mr F. W. G. Beaumont, Mr L. B. H. Hallett** and **Mr N. A. W. Stacey,** and the directors of Sumo Pumps Ltd, **Mr John Raymond, Mr T. O. Orr, Mr F. W. G. Beaumont, Mr L. B. H. Hallett** and **Mr N. A. W. Stacey.** All except Mr John Raymond are new directors appointed from the management of the companies. Mr Raymond, who is managing director of Stone-Chance Ltd, has been on the board of these subsidiary companies for the past ten years. The other directors of Stone-Chance Ltd are Mr Bryan Preston (chairman), Mr A. J. S. Brown and Mr P. A. Peterson.

At the annual general meeting of the Institute of Welding recently, **Mr R. G. Braithwaite,** M.INST.C.E., director and welding consultant to Braithwaite and Co. (Structural) Ltd., was installed as president in succession to **Mr A. Robert Jenkins.** The new vice-president is **Mr R. E. G. Weddell,** joint managing director of W. G. Allen and Sons (Tipton) Ltd.

OBITUARY

Mr H. A. Smith, of Yeovil, district constructional engineer to the Southern Electricity Board has died, aged 54.

Mr R. E. Moore, sales representative of Foster Electrical Supplies Ltd, died on 20 July, aged 73. He joined the Foster organisation in 1919 and was in the company's employment up to the time of his death.

Mr John Browne, senior representative in Scotland for Falk, Stadelmann and Co., Ltd., died on 28 July. He had been with that concern for about 30 years.

Mr Gilbert Farrar, B.SC.(ENG.) HONS., a commercial engineer in the Turbine Sales Department of the British Thomson-Houston Co. Ltd., Rugby, died on 26 July.

Mr C. S. Kent, C.B.E., a director of Gresham Transformers Ltd. since 1950, died on 30 July aged 67. Previously he had an outstanding career in newspaper management, ultimately being manager of *The Times,* from which he retired in 1949.

Mr P. H. Wilson, O.B.E., M.I.MECH.E., deputy managing director of Stanton Ironworks Co., Ltd, died on 25 July, aged 69.

NEW LITERATURE

Electrical Engineering for Mining Students

by G. M. Harvey, M.SC., B.ENG., M.I.E.E.

ALTHOUGH primarily written for the student mining engineer this book could well be read by students of any branch of engineering. It deals clearly and concisely with the rudimentary theory of a.c. and d.c. and then moves rapidly on to describe transformers, all forms of rotating machinery and associated equipment. The general standard of treatment is that of Ordinary National Certificate level, the use of mathematics having been avoided wherever possible and calculus not used at all. Now in its second edition the subject matter has been revised to bring it into line with modern practice. Second edition, published by Sir Isaac Pitman and Sons Ltd, 156 pages, 7½ in. by 5 in. Price 15s.

Meter Engineering

by J. L. Ferns, B.SC.(HONS.), M.I.E.E.

THIS is the sixth edition of this excellent book, which is now rapidly approaching the status of a standard treatise on the important subject of meter engineering. Opportunity has been taken to bring the information it contains up to date, but fundamentally the book remains much the same as in its previous editions. It deals primarily with the testing and maintenance of the commercial electricity meter, although a simple and clear exposition of the fundamentals of all types of meters is included. A review is also given of the constructional details of many types of standard manufactured meters. Published by Pitman, 353 pages, 5 in. by 7¼ in. Price 27s.

British Journal Photographic Almanac 1954

Ed. Arthur J. Dalladay, A.INST.P., F.R.P.S.

THE second less familiar title of this old friend "The Photographers Daily Companion" is as true today as it was when it first appeared as a separate publication in 1866.

The wealth of information which is presented in this annual makes its price seem almost unfair to the publication. The familiar tabular matter including chemical formulae; optical, exposure and copyright information is again presented in up-to-date form along with the most welcome survey of new goods.

Articles include nature photography with electronic flash by John Warham, A.R.P.S., and a feature on the construction of a compact ring illuminator using 24 V 6 W festoon lamp holders. Published by Henry Greenwood and Co., Ltd. 620 pp. 7 in. by 5 in. 5s.

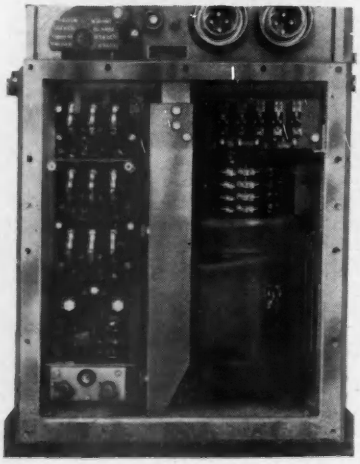
Equipment for Industry

Mining Drill Units

FOLLOWING the introduction of new safety requirements for mining equipment by the Ministry of Fuel and Power the necessary modifications have now been made to mining drill units manufactured by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester. The units involved are the type MDU 32 which operates two 50 c/s drills and the MU 12 which operates two 150 c/s drills. Protective features now include an electrical lock-out circuit of the intrinsically-safe type, which electrically locks out the drill contactors until the earth-fault is removed, and a certified intrinsically safe low voltage pilot control circuit for each drill. Overcurrent protection is provided by an instantaneous latch-out magnetic relay and overload protection by a self-resetting thermal induction relay.

Features common to both units include enclosure in cases certified flameproof for Group 1 gases, whilst both are suitable for operation on a 3-phase 50 c/s supply up to 650 V. Each consists of two main parts, of which the upper chamber contains busbars with a flameproof terminal plate at each end and a triple-pole non-reversing isolator interlocked with the door of the lower compartment. In the type MDU 32 the lower compartment contains the drill transformer which supplies power for two 1½ h.p. drills whereas the MU 12 contains a frequency-changer capable of operating two 1 h.p. drills, the voltage in both cases being 12·5 V, 3-phase.

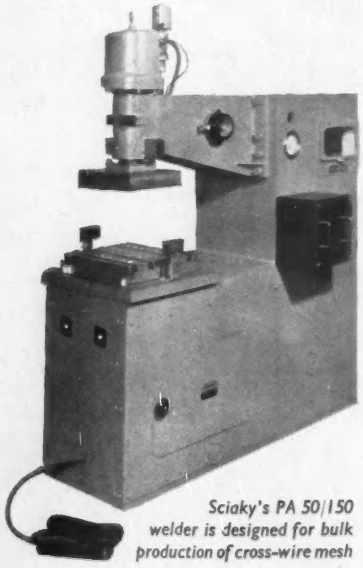
Side view of Metrovick's mining drill unit MU12 for two 150 c/s drills, showing frequency changer and control gear



Multiple Welder for wire mesh

FOR multiple projection work a new welding machine manufactured by SCIAKY ELECTRIC WELDING MACHINES LTD, Farnham Rd, Slough, Bucks, is particularly suitable for the bulk production of crossed-wire mesh. A useful feature is the arrangement of the transformer and tee-slot platen by which the effects of the secondary loop are reduced to give, it is claimed, a high electrical efficiency and power factor of approximately 0·9.

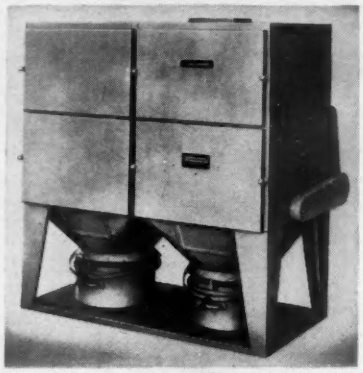
With this machine, which is known as the PA 50/150, wire mesh may be produced in squares or as a series of lines. When the latter technique is adopted, advantage may be taken of the automatic feed-in which makes it possible to produce long lengths of mesh by arranging to feed-in the cross-wires automatically, at a speed of approximately one operation each second. Control of the welding current and therefore of the temperature of the weld is effected by a phase-shift regulator in the primary circuit allowing infinitely variable adjustment. Operated pneumatically, the head cylinder can develop up to 4,000 lb pressure. The machine head is retracting to give clearance for loading and unloading.



Sciaky's PA 50/150 welder is designed for bulk production of cross-wire mesh

Automatic control of dust

THE use of unit dust collectors of the fabric type involves manual agitation of the filter media at periodic intervals, a maintenance duty which can, on occasion, be overlooked, with consequent deterioration in the operation of the collector. To circumvent this possibility, DALLOW LAMBERT AND CO., LTD., Spalding St, Leicester, have now introduced a unit which, when fitted to their fabric-type filters ensures automatic cleaning at regular predetermined intervals.



This Dallow Lambert "Dustmaster" dust collector is shown fitted with their new "Auto-shaker" filler agitator

Capable of being applied to any one of the company's range of collectors, the unit comprises special control gear governing the electrically-driven agitators. It is interlocked with the fan motor starter so that as the fan motor is switched off, the shaking time cycle commences after a suitable delay in which the impeller is allowed to come to rest. The agitator then comes into operation for a given period of time, the interlocking system ensuring that the fan motor may not be restarted during this period, nor in an interval both before and afterwards. After the complete time cycle has elapsed, the mechanism resets itself for the next operation. As a further refinement, all electrical controls may be interlocked with the machine or operation served by the collector.

Switchgear on test

DURING recent months, tests have been carried out successfully on interruptor heads fitted to the rocking or rotating-pattern 33 kV isolator switches manufactured by LINE EQUIPMENT LTD, 32 Queen Victoria St, E.C.4. From these tests, which were carried out under conditions intended to simulate hand operation, results at −0·1 p.f. gave a charging current of 37 A and magnetising current 35·5 A and at 0·7 p.f. a load current of 400 A. Made for switchgear in a voltage range of between 11 and 88 kV such interruptor heads are to be tested at higher voltages at a later date.

Seams from a Spot Welder

WE have been requested by MERITUS (BARNET) LTD., with reference to the article which appeared on page 130 of our 22nd July issue under the above title, to emphasise that although the method of producing seams on a spot welder does not compete with a special purpose seam welder for continuous production of seam-welded assemblies, the quality of work produced is highly satisfactory.

And Now the "Super Smoothwell"

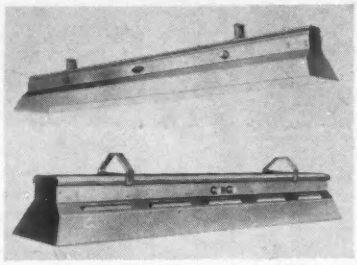
NEWS of the "Super Smoothwell" automatic iron has now been released by PREMIER ELECTRIC HEATERS LTD., Keeley St, and St. Andrews Rd, Birmingham 9.

Comfort ironing is an important feature of the Super Smoothwell, seen here with the sales aids available to dealers

This new model is designed on up-to-date lines with large comfort grip handle and easy to see and set selector dial. It is finished in first class durable chromium plate, is fitted with a snap action thermostat and indicator light. Weight is 5 lb, rating 750 W and Catalogue No. 835. The Super Smoothwell will sell at 45s. list price and will be packaged in a colourful carton. Bright attractive counter stands are additional sales aids available to retailers. Voltage ranges 110/120 V, 200/220 V, 230/250 V a.c.

New Fluorescent Lighting Fittings

SPECIALLY designed for light industrial needs, where the atmosphere is clean and dry, a new range of "Flurolier" fittings with the new "Peropal" white finish has been introduced by BENJAMIN ELECTRIC Ltd., Brantwood Rd, Tottenham, N.17. "Peropal" finish is achieved by a new technique of high temperature stove enamelling, embodying a synthetic resin which imparts protective and durable qualities. It is emphasised by the firm that if the atmosphere, in which the fittings operate, is other than clean and dry, the "Crysteel" vitreous enamel finish should be specified. Made in various sizes the range includes fittings for one or two 5 ft. 80 W or 4 ft. 40 W lamps.



In the top illustration is seen the closed top model for one 80W lamp, the upward light model below it

For the Electrical Trade

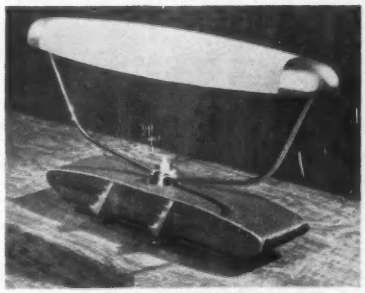
Features include easily detachable reflectors, with or without top-light facilities and auxiliaries and main wiring housed in top-channel of fitting. A special angle version housing a 5 ft. 80 W tube has its main axis 35° to the vertical.

Soldering in Seconds

A NEW soldering iron which, it is claimed, will heat up in 6 seconds from switching on, is being produced by the Australian firm SCOPE LABORATORIES. Designed for use by electronic or radio engineers it will operate in conjunction with a transformer stepping down to from 2·5 to 6 V or on d.c. The iron is switched on by means of a ring switch on the handle, normal consumption is 120 W and it is continuously rated. ARTHURS, Gray House, 150-152 Charing Cross Rd, W.C.2, are marketing this iron at a price of £1. 19s. 0d. and the transformer is £1. 17s. 6d.

Fluorescent Desk Lamp

ATTRACTIVELY designed, a new desk lamp being produced by SIEMENS ELECTRIC LAMPS AND SUPPLIES LTD., 38-39 Upper Thames St, E.C.4, is ideal for use in modern offices or in the home.



Siemens' attractive desk-lamp incorporates pen rack for office use

The 18 in. 15 W tube and plastic shade are supported by arms fixed to the base which contains the control gear therefore giving a completely self-contained unit. The lamp is finished with heat-resisting enamel in a wide range of colours.

TRADE PUBLICATIONS

REFRIGERATION. — Publication Z132/1 issued by Pressed Steel Co., Ltd., Cowley, Oxford, is a general equipment broadsheet.

METAL SPRAYING.—An illustrated full colour brochure has been published by Metallisation, Ltd., Pear Tree Lane, Dudley, Worcs., to publicise the British Wire process of metal spraying.

TELEPHONE EQUIPMENT.—A leaflet issued by Communications Systems Ltd., Strowger Hse, 8 Arundel St, W.C.2, introduces a "Telephone Service for executives" which can be associated with an existing private internal automatic system.

DIESEL ENGINES.—Rail traction diesel engines, RHA series diesel engines and oil operated reverse reduction gear boxes are described in leaflets 267, 1282 D and M1602, issued by Associated British Oil Engines (Marine) Ltd., Wellington Works, Ashton-under-Lyne, Lancs.

ALLOYS.—Technical data on Hiduminium sheet and plate is set out in a booklet published by High Duty Alloys Ltd., 89 Buckingham Ave., Trading Estate, Slough, Bucks.

FLASH BULBS.—"Perfection in a Flash" for 1954/5, dealing with photographic flash-bulbs, is now available from the Special Lamps Dept., Lighting Division, Philips Electrical Ltd., Century Hse, Shaftesbury Ave, W.C.2.

LIGHTING FITTINGS.—Commercial lighting fittings comprising a complete range are listed and illustrated in new catalogue 801/54 issued by Falk Stadelman and Co., Ltd., 91 Farringdon Rd, London, E.C.1.

T. W. TRANSFORMERS.—Catalogue published by Transformers (Watford) Ltd., Sandown Rd, Watford, Herts., to announce that they now manufacture transformers up to 30 MVA rating.

PROTECTION AGAINST RUST.—Two leaflets published recently by Tool Treatments (Chemicals) Ltd., Colliery Rd, Birmingham Rd, West Bromwich, describe their "Chemical Black" finish and dewatering plant used in conjunction with their dewatering fluid.

METAL RECTIFIER ARC WELDING PLANT.—The type MR 375 d.c. arc welding plant employing metal rectifiers and having a range of 25 to 375 A, is described in a technical circular T.C. 898 issued by the Quasi Arc Co. Ltd., Bilston, Staffordshire.

MOTORS.—A leaflet by Newman Industries Ltd., Yate, Bristol, shows that 305 Newman motors are installed in the cylinder block machining shop at the Standard Motor Works.

LIGHTING FITTINGS.—A revised catalogue is available giving details of all the plugs and sockets, conduit fittings and allied apparatus manufactured by Clang, Crown Yard, Cricklewood, N.W.2.

PROBLEMS AND PRACTICE

In Engineering

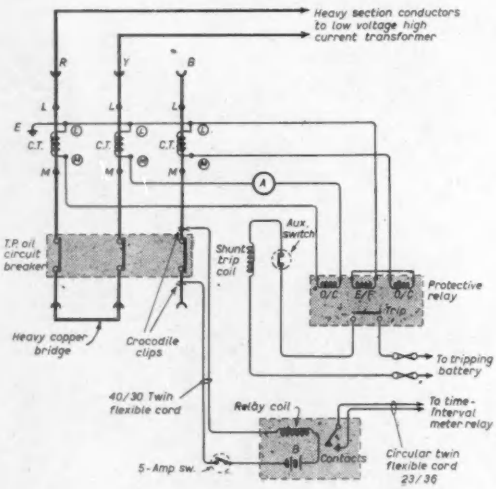
Relay Testing

WHEN testing the overall operating times of protective relays and their associated oil circuit-breakers by the primary injection method one very often comes across switchgear which does not incorporate a suitable auxiliary switch by means of which the time interval meter may be automatically stopped. This difficulty may be overcome by using an ordinary battery operated relay, provided the relay contacts insulation is suitable for the time interval meter voltage (usually either 110 V or 230 V a.c.).

For convenience, the relay and its battery may be assembled in a wooden box on which is also fixed a small 5 amp single pole switch, to isolate the battery when not in use. The relay operating coil circuit thus consists of the coil, battery, switch and a suitable length of twin flexible cord (say, size 40/36). Attached to the two free ends of this flex are large "crocodile" clips suitable for connecting to the terminals of any one unused phase of the oil circuit-breaker under test. Thus, immediately the o.c.b. opens, the operating coil of the battery operated relay is de-energised, allowing its contacts to close and thereby energising the time-interval meter de-clutch coil to stop the clock.

This method, using the auxiliary relay, has proved to be of real value when protective relay testing. The advantage of testing the overall operating items of protective relays and associated o.c.b.'s lies in the fact that no connections whatever are disturbed (except of course the tripping battery circuit with truck type gear).

Circuit for testing protective relays associated with switchgear in which no suitable auxiliary switch is incorporated



Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

The actual time for the battery operated relay contacts to close, after the o.c.b. has opened, has been found to be negligible, and in any case the error is on the right side.—*E. A. Robbins.*

Common Troubles

WHAT are often described as "mystery jobs" have a simple straightforward explanation and if basic principles are followed the solution is obvious. The following are two instances which illustrate this point.

A three-phase slipring induction motor had been installed by a local contractor to replace a gas engine driving a mortar mixer. The motor was described as starting up satisfactorily but when the starter handle reached the full "on" position the circuit fuses blew. On investigation it was apparent that the motor was "snatching" at starting and further examination showed that the stator and motor leads had been interchanged at the starter terminals. The three leads from the stator winding and the three leads from the rotor winding were in the same terminal box and all six leads had been run in one conduit and as the starter was some distance from the motor it would have helped if different colour cables had been used for the stator and rotor circuits.

The next case concerns a generator driven by Vee belts from a diesel engine and installed at a local picture house. On the opening day it was found that with full house lights on the generator voltage fell away and the house light were nowhere near the brilliance expected. On arrival the show was in progress and with the house lights off the generator voltage was normal and, waiting for the interval, were representatives of the engine maker and architect who were quite sure there was something wrong with the generator. Looking round in the vicinity of the generator pulley was a black powder which had been thrown from the Vee belts, and it was clear that these had been slipping. With a new set of Vee belts it is not possible to always guarantee these to be of the same length and a certain amount of stretch takes place. The belts were tightened up and when the moment arrived for putting on the house lights the voltage remained steady, the previous drop being due entirely to slipping belts.—*J. E. R.*

Flexible Cable Clip

A SIMPLE gadget which will keep long flexible leads neatly coiled can be made from a length of soft steel strip of about 3/8 in. by 1/32 in. thick. As shown in the illustration, the strip is bent to form a series of open-sided loops which can be formed by means of a pair of round-nosed pliers.

This useful clip for holding flexible cables is easily made

The clip is applied to the cable coil by laying it down on a flat surface and pressing the cable down on to it. The wires will automatically slip into the loops on the metal strip and will be nipped therein if the loops have been formed to correct size and shape. These sizes and shapes can be ascertained by experiment before the whole length of strip is bent. Any sections of the cable coil which are still loose after the top surface of the strip has been filled can be secured to the other side by pressing the loaded strip down on to them.

The clip illustrated was made from a 15 in. length of strip metal. Excess loops that are not required and are unlikely to be filled with cable can be cut off after the clip is made. It is advisable to make the loops slightly pear-shaped so that the open mouth is slightly smaller than the diameter of the actual loop. This shape will tend to lock the cable in place, but will release it if it is pulled with sufficient force.—*C. T. Bower.*

NEWS OF THE WEEK

Biggest Australian Electrical Fair

£1m worth of Exhibits — Accent on Television

ARRANGEMENTS for the Victorian Electrical Industries Fair, to be held in Melbourne this October, are progressing rapidly. It will undoubtedly be the largest exhibition of its kind ever held in Australia, containing over £1 million worth of exhibits and attractions and covering every aspect of electrical and electronic development over the past two decades. Further details of the exhibition, which is being organised by the Electrical and Radio Federation of Victoria, reached us this week from Melbourne. Announcement of the Fair and a few preliminary details were given in these columns over a year ago. Over 50 manufacturers in the electrical and radio industry, as well as supply authorities and the State Electricity Commission, will be participating. Although every opportunity will be taken to point out the special advantages electricity offers in the domestic, industrial and agricultural fields, particular emphasis is likely to be laid on television, which has as yet not been introduced into Australia for the general public. It is significant that in the past few years in Australia, the electrical industry has become the largest secondary industry of the Commonwealth, and in Victoria alone 90% of the population use electricity. A large contribution towards the development of the electrical industry in Australia has been made by British firms and now that the import regulations are something like normal again fresh opportunities are continually presenting themselves in this field, whilst there is a steady demand for the heavier equipment, and a potentially heavy demand in the radio industry in view of the imminence of television.

The exhibition promises to be a great success both from the manufacturers' and consumers' points of view. Nor has the "atmosphere" of the Fair been left unconsidered. The ground outside the exhibition and the building itself will be gaily illuminated by thousands of lights, not to mention illuminated flower beds and fountains. A big attraction inside will be the maypole of light, weighing a ton and reaching over 100 ft into the dome of the roof.

Fire at LDC Laboratories

THE laboratories and pattern shop of the Lancashire Dynamo and Crypto Ltd. at Trafford Park, Manchester, were destroyed by fire early on Wednesday of last week. Although valuable equipment was wrecked, no original drawings were lost, we understand. Arrangements have already been made for pattern work to be done elsewhere, and there will be no interference with production.

MAY SALES OF RADIO AND TELEVISION SETS

SALES of both radio and television sets improved a little again in May. Those of radio sets continue to be above the corresponding figures for 1953, whilst TV sales are of course well below because May last year was the peak month for pre-Coronation buying. The average number of sets sold per shop according to the R.T.R.A. index for May was:

Month	1954	1953
Radio:		
April ...	8·42	5·68
May	8·49	7·07
Television:		
April ...	5·36	10·22
May	6·01	18·74

Results of the removal of HP restrictions will be awaited with interest.

DUTY-FREE MACHINERY WILL BE ALLOWED

THE Government has accepted the recommendations of the Wilson Smith Committee on duty-free entry of machinery (reported last week)with one reservation. The President of the Board of Trade announced last week that the duty-free licensing of machinery under Section 10 of the Finance Act 1932 would be resumed as from yesterday, 4 Aug. It will apply to all articles not delivered from Customs charge before that date, provided that the B.o.T. has received the importer's application and the Customs have been informed. Applications should be submitted to the I.M.1 Div., B.o.T. Horse Guards Ave., London, S.W.1.

The recommendations of the Committee were briefly referred to in these columns last week. The one which has not been immediately accepted concerns the extension of duty-free provisions to cover plant. The Government has reserved a decision on this point as it would require legislation. The matter will be fully discussed with the consultative committee when appointed.

Remedying the shortage of Science teachers

"A REVISION, at the earliest possible moment, of salary scales in order to make teaching financially more attractive" is one of the major recommendations made by the independent committee set up in Jan. this year by resolution of a conference convened by the Federation of British Industries to enquire into the current shortage of Science Teachers. This shortage is seen against the general scarcity of scientists at present, for which they advocate both a progressive expansion of university science departments and an overall increase in the proportion of sixth form students taking science courses in grammar and independent schools. Their financial recommendations are suggested as one of several remedies for an estimated deficiency of teachers of 230 each year between 1950 and 1960. Although this deficiency would, at present, have to be made up at the expense of industry and universities, these outlets for science graduates they feel, will not suffer as a result.

Fewer Embargoes on Our Trade with Russia

A CONSIDERABLE reduction in the size of the lists of goods which may not be exported to Russia was announced by the President of the Board of Trade last week. Negotiations have been in progress for several months now but agreement has been reached on the majority of points under discussion, with the general result that the existing embargo list will be reduced by about one-third from 250 to about 170 items, and the quantitative control list even more drastically from 90 to 20 items. This is to take effect from 16 Aug. A watch will be kept on about 60 other items however, to see the trend of exports. A complete list of items wholly or partially banned from the Soviet Union may be published in a week or two's time but some problems of definition have still to be solved. Discussions on these are proceeding with the 16 other countries involved. Hitherto no specific list of goods banned has been issued in respect of Russia, although one for China does exist.

In view of the electrical industry's recent successes in gaining contracts from Russia, the list will probably be of considerable interest. A fair proportion of successes gained was in cable exports and certain concessions can be expected in that field, whilst a raising of the capacity limits on generating sets and similar relaxations are also anticipated.

Britain's Best Continental Market surveyed

IN TERMS of value, Britain's best customer on the Continent, and her eighth most important in the world, up to two years ago, was Sweden. With over 90% of her imports free from import restrictions, Sweden offered an excellent market to our exporters to maintain and expand trade, or to introduce their goods into the country. That position cannot be said to have altered a great deal, nor has Sweden's ready acceptance of U.K. commodities, although obviously her own industries have been progressing in that time. Thus, the Overseas Economic Survey of that country just published by the Board of Trade becomes one of the most important in the series.

Sweden possesses an abundance of potential hydro-electric power which she is rapidly exploiting. The most ambitious projects, constructing tunnels, generating machinery and transmission lines are being carried out. The last are of considerable interest as about 85% of the power is in the north and over 83% of the population in the south. Total resources of water power are estimated at about 150,000 million kWh, although about 60,000 million kWh is economically exploitable. Combating Sweden's enthusiasm for development is a persistent shortage of qualified staff, and, from time to time, delays or bottle-necks in the delivery of materials and equipment, especially power station machinery. The country's largest power station at Stornorrfors, estimated to produce 2,200 million kWh a year, is expected to be completed in 1959. Another 380,000 V transmission line will have to be built to carry current southwards.

Such large-scale development has led to the expansion of an important electrical industry which is producing much of the equipment needed for new power stations, whilst output also extends in no less a degree to smaller items and domestic appliances. She still has plenty to export and is a keen rival in world markets, but it is notable also that in 1952 Sweden imported U.K. goods to the value of £88,500,000, over 28% of which consisted of machinery and apparatus of various kinds. Prominent items in this group were generators and other electrical machinery, pumps and refrigeration machinery. Competition among domestic manufacturers in the field of industrial electrical plant, switchgear and cables is very keen, nevertheless a market can and has been found in a wide range of goods. The same might be said of the commercial electrical equipment field.

Local production of household electrical equipment is considerable and covers almost the whole range of appliances, but even so the U.K. has taken a useful share of the market for washing machines, vacuum cleaners, fans and refrigerator parts. Finally, we note that in towns and the more populous localities electricity is now available to nearly everyone. In rural districts, 87% of homes are now electrified and almost all farms have a supply.

Revised Welsh H.E. Schemes

THE British Electricity Authority has approached the Minister of Fuel and Power for consent to promote a Bill, possibly in the next Parliamentary session, to obtain sanction for two hydro-electric projects in North Wales. One relates to a hydro-electric scheme on the Rheidol River, Cardiganshire, and the slopes of Plynlimmon, and the other proposes a pumped storage scheme for Blaenau Festiniog. The earlier Rheidol scheme, among six projected for North Wales, and withdrawn two years ago, is being revised, while the Blaenau Festiniog scheme is to be changed from a straight hydro-electric to a pumped-storage project. We understand that the B.E.A. has already communicated with all local authorities concerned seeking meetings with officials at which details of the schemes can be given.

No Change in Winter Load Spreading Plans

ARRANGEMENTS for load-shedding next winter will be substantially the same as in 1953-54. The Minister of Labour, Sir Walter Monckton, stated last week that he had accepted the recommendations of the Electricity Sub-Committee of the Joint Consultative Committee contained in their report published last Thursday. The main recommendation is that Regional Boards for Industry should have discretion to make load spreading arrangement in the light of local conditions, and for that reason the Load Spreading Committee would remain in being. It is also recommended that the use of private plant should be encouraged, as before, in winter peak hours, and a general appeal for economy at those times made. These proposals are based on average winter weather.

Commenting on last winter the report states that supplies were discontinued on only one occasion compared with nine in 1952-53. Some reduction in voltage and frequency was necessary on various occasions. Attention is drawn once again to the Glasgow and Bristol Grid Control Areas, where special arrangements may again be needed.

OFFICIAL PUBLICATIONS

OVERSEAS ECONOMIC SURVEY Sweden (see this page). H.M.S.O. 4s.6d.

ELECTRICITY LOAD SPREADING. Report of sub-committee of Joint Consultative Committee to Min. of Labour (see this page). H.M.S.O. 4d.

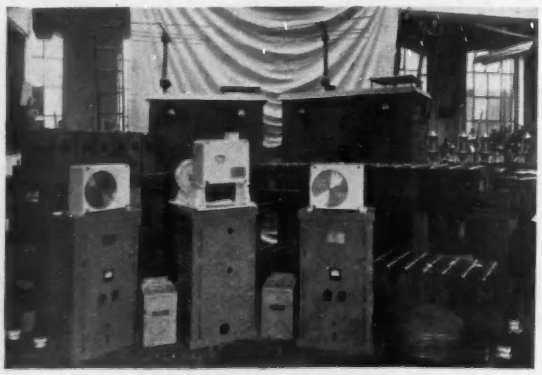
EXPORTING TO U.S.A. Published by B.o.T. H.M.S.O. 3s. 6d.; also SETTING UP A SUBSIDIARY IN CANADA, published by and available from B.o.T. *gratis* (see page 204).

British Tide Gauge for Persian Gulf

A RADIO linked unattended tide gauge which continuously transmits information on the depth of water over the sandbanks at the mouth of the Shatt-al-Arab river in the Persian Gulf, has been developed by the Gas Accumulator Co., Ltd., for Basrah Port Directorate. The gauge will replace the control vessel now stationed some 12 miles out.

One of the problems posed was the question of power supplies and specially designed alkaline storage batteries with their associated control gear were ordered from Nife Batteries as a solution. The total tidal range of 14 ft has been divided into 140 measurable units and the time taken to transmit each message spread out to about 2¼ minutes. Ashore, output from the receiver is fed to an integrator which interprets the signals by operating a pointer against a dial scaled in one-tenths of a foot. All radio equipment is being supplied in duplicate. Two groups of 13 Nife BN15 steel alkaline cells in parallel, with a total capacity of 750 Ah, provide l.t. supplies in series; h.t. is drawn from 210 Nife FA4 cells, capacity 45 Ah: and grid bias from a further battery of 42 FA4 cells. Charging is carried out fortnightly through automatic taper chargers by diesel-alternator set forming part of the installation at the transmitter.

The importance of accurate knowledge of the depth of water arises at this port because shipping can only move over the numerous sandbanks at certain states of tide, the height of which varies through such unpredictable factors as wind and weather.



Part of the radio linked tide gauge for the Port of Basrah awaiting shipment from this country.

Entrance hall of Chance Bros' new office block where glass of various types has been used extensively. Note the filament spotlights, and the recessed ceiling panel

Office Block almost a Modern Crystal Palace

WHEN the architects, Clifford Tee and Gale, were commissioned to design Chance Bros' new office block in Spon Lane, Smethwick, they were asked to use the company's building glass wherever they could. That they succeeded in their task is more than evident as soon as one enters the two- and three-storied building. A screen of Spotlyte pattern glass and the engraved Armourplate glass door are features of the entrance. Spotlyte and Rough Cast glass has been used in the construction of the staircase balustrade.

The lighting installation, too, employ many of the company's products. The fluorescent fitting used throughout the offices was designed by the architects and made by Philips Electrical Ltd. Filament spotlights in the ceiling of the entrance hall have bent-figured rolled glasses of various patterns, or of Fiesta decorated glass. Wiring was carried out by Chance Bros. themselves, Thorn Electrical Industries and Philips were responsible for the fluorescent lighting and Merchant Adventurers for the tungsten fittings.

Message Centres are helping Rural Consumers

AN experimental scheme to help consumers in outlying villages and hamlets whose nearest electricity service centre is many miles away, appears to be working extremely well in the N. Staffordshire area of the Midlands Electricity Board. The scheme was inaugurated with the main object of enabling consumers to contact the Board for repairs or power failure. The Board consequently set up message centres in the Leek district, covering an area of about 250 sq miles.

The Board enlisted the help of four local post offices, a cafe, and a grocer's shop in six villages. Each of these message centres has been provided with an MEB sign and arrangements have been made for messages from local consumers to be passed on to the Board by telephone or other suitable and speedy means. In addition the centres have also been given a supply of literature on equipment, credit sales terms and the like. The experiment is working well and consideration is being given to establishing centres in other villages.

The "plight" of people in rural areas is also receiving the attention of the S.E. Consultative Council. Reason in their case, however, appears to be mainly that consumers find it difficult to pay their bills. At their recent meeting the Council was reminded that the Gas Board provided addressed envelopes. It was also suggested that villagers could pay their accounts through post offices. Information on the subject is being collated for submission to local committees.

The First Half-Century

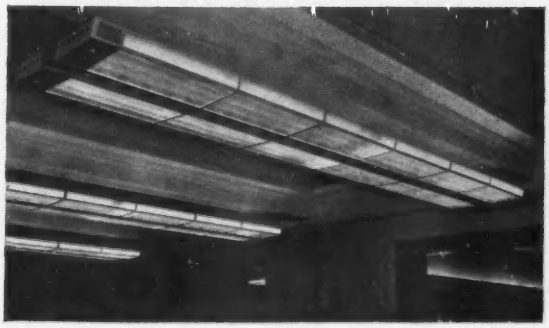
A valuable supplement on the railways of Great Britain has been published by the *Statist*. It contains a terrific accumulation of statistics, from which electrical engineers, anxious to electrify our railways, may dig much useful information. That we are becoming more democratic is shown by the relative diminution of first and second class passengers. No fewer than 91% of travellers now go third; the first class cariages carry less than 3%. Perhaps it would be more accurate to say that less than 3% take first class tickets, for presence in a first class carriage does not always connote possession of a first class ticket. Average mileage per passenger steadily decreases, reaching as low a figure as 7·8 miles, doubtless because of the growing tendency to live in the suburbs away from one's work. Passengers per train average 52·81. These figures indicate a future on shorter routes for the motor coach (preferably electric) with only one class; giving about five times as good a service as is at present given by the full-size, half-empty, infrequent local train.—*From our issue of 4 Aug.* 1904.

Cold Cathode Lighting for London Store

SPECIAL fittings were designed for a notable cold cathode lighting installation carried out in the Regent St (London) store of Dickins and Jones.

Each of the fittings is self-contained, the transformers being incorporated in the central spine. They are in two sizes, to accommodate groups of either 12 or 6 tubes, and they are suspended by down rods from the beams. Maintenance is facilitated by having the glazed underside and sides hinged downward to expose the lamps and adjacent h.t. cable, all other wiring and control gear being accessible from hatches in the top of the central spine. The underside and sides are glazed with luminating glass and the top with clear glass.

These special fittings were made by George Forrest and Son Ltd., to the design of Mr Trevor Dannatt and developed by them in collaboration with Drake and Gorham who also undertook the installation work.



A close-up of some of the special fittings used in the cold cathode lighting installation on one of sales floors of Dickins and Jones

Impulse Tests

IN our 15 July issue we reproduced a photograph of transformers being subjected to impulse tests at the Trafford Park works of the makers Metropolitan-Vickers Electrical Co., Ltd. Unfortunately the rating was given as 102 MVA whereas it should have been 120 MVA.

EXPORTING TO U.S. . . .

PUBLISHED last week by the Board of Trade is an up-to-date guide on selling to America. It is in fact a revised edition of "Exporting to the U.S.A." and is designed to help anyone who is interested in doing business in this important dollar market, whether he be established or tackling the country for the first time. It summarises the special features of market, American business practices and gives an outline of the main U.S. Government regulations affecting foreign traders. In particular, this guide emphasises the help which is available on request from official and private bodies on both sides of the Atlantic.

. . . AND CANADA

SOME guidance for firms who may be considering the establishment of a subsidiary organisation in Canada is contained in a 14-page pamphlet also produced recently by the Board of Trade. In such a small publication there is no more than an introduction to the subject, but a start has to be made somewhere and it should give some fundamental knowledge. Examples of matters dealt with are: application to the Bank of England and Treasury; difference between Dominion and Provincial Registration; solicitors' fees and fees for incorporation; selection of name and taxation. It also lists a number of useful Canadian contacts.

RECORD BREAKING ON THE RAILWAYS

A PICTURE of trains racing to achieve speed records was conjured by Mr Cecil J. Allen in a talk on "Railway Speed record breaking" he gave at the Batti-Wallahs luncheon last week. After tracing the history of record breaking in Britain over the past fifty years with steam engines, he turned his attention to the latest achievements of American, German and French engineers. He stated in conclusion that France holds the "blue riband" with straight electric traction where on a run between Dijon and Beanne a speed of over 150 m.p.h. was reached.

Should Rural Electrification be National Responsibility?

LAST week's explanation by the S. Wales Electricity Board concerning the imposition of capital charges for supplies to rural premises has been followed by the Merseyside and N. Wales Board's explanation on the financing of rural electrification schemes. The Area's Consultative Council had asked for a statement of policy on the subject, arising from the fear expressed last March (see our 18 March issue) by Liverpool industrialists that they would have to pay extra charges to carry the burden of extending supplies to farms in N. Wales.

In a letter to the Council the Board stated that they and other Area Boards should operate and develop supplies without central financial help. If they met insurmountable difficulties then the responsibility rested with the Central Authority. Such difficulties might be attributable to rural electrification work or to other unremunerative developments which could not be overcome from the Board's own resources.

The letter was received by the Council at their recent meeting at Chester. One member said that if a position arose whereby industrial areas were in any way paying for rural electrification, he thought the situation was covered in the letter: the Council should not then divide into two camps but regard it as a difficulty which neither they nor the Board could overcome and it would be proper to submit it to the Central Authority. Another member said rural development was costly and should be spread equally over the whole country rather than that it should rest on one Board.

The same problem was also discussed at a recent meeting of the Midlands Consultative Council. It was stated that if it was a national problem to take electricity to farms in the interests of food production, then it ought to be a national responsibility to take electricity to farms. It ought not to be charged to industrial areas. The N. Staffs local committee suggested that rural development should be financed by the Exchequer. Charges all over the country had been increased 30% to pay for rural electrification schemes, it was alleged; £32,000 was to be spent shortly on a scheme in the Midlands. The question was posed, who would foot the bill. In the main the money would come from industrial areas, but was it right for industry to "subsidise" rural consumers. The matter was referred to the Council's Tariff Sub-Committee.

NEWS IN BRIEF

First European Conference devoted entirely to management problems is being organised by the British Institute of Management. It will take place at Torquay between 20 and 23 Oct.

Imported Wire Goods Enquiry to be held at the Board of Trade's offices in London, has been postponed. It was to have opened on 19 Aug., but a new date will be announced in due course.

Institution of Heating and Ventilating Engineers are to hold a special meeting on 14 Sept. when Mr John K. M. Pryke, the New York consulting engineer, will speak on "Current American Practice in Heating, Ventilating and Air Conditioning."

An official post of "Blinking Beacon Polisher," whose task it is to keep the beacons on pedestrian crossings clean, has been created by Worthing council.

S.E. Area final of the E.I.B.A. National Golf Championships was won by Mr R. L. King on the East Brighton course. Open match at the same meeting was won by Mr F. Thompson.

One of the summer's few fine afternoons favoured the Family Day and Children's Sports organised by Henley (Woolwich) Social and Sports Club held at New Eltham last month.

Wild-Barfield Electric Furnaces Ltd. are again extending their invitation to parties of up to 30 senior engineering students from Technical Colleges and members of Technical Societies, to visit their Watford works during the winter months.

First consignment of a contract for 500 kVA, 11 kV T.W. distribution transformers, dry type air cooled with all Silicone impregnated insulation using only class H materials, leaving the works of Transformers (Watford) Ltd. This is the first delivery of this type of transformer in this country.

Sayings OF THE WEEK

"Our figures (of units sold) give a better idea of the weather than anything the Meteorological Department can do." . . . Mr W. S. LEWIS, chairman of the Midlands Electricity Board.

"It is to be hoped that the improvement in orders will continue, since expansion of production alone will enable industry to absorb the further wage advances which have again been granted in the present year." . . . SIR HARRY RAILING, chairman and joint managing director of the General Electric Co., Ltd.

"Our attitude towards engineers contrasts markedly with that on the Continent. We need more engineers with a broad education who can be chosen and trained as policy makers." . . . Mr IAN MACKINTOSH, of the resident engineer's office, Portishead "B" power station, writing to the *Manchester Guardian*.

ELECTRIC SUPPLY NEWS

Edinburgh

There are many houses without electricity in Edinburgh within a mile of the Portobello power station, it was revealed at a recent meeting of the town council. But at the meeting it was decided by 25 votes to 18, with two abstentions, to adopt a Housing Committee recommendation of "no action" with regard to a proposal for the installation of electricity in these 94 houses in the Lochend area. The Lochend Tenants' Council has made representations for the installation and a house-to-house survey had been undertaken by the Housing Executive officer. It was stated that the Lochend area comprised 1,437 houses, of which 145 had been equipped with electricity at the time of erection, the remaining 1,312 being provided with gas lighting. The present position was: Lit wholly by gas—94; lit by electricity installed at expense of tenant —1,058; lit partly by gas and partly by electricity, the latter being installed at expense of tenant—160. The survey had shown that in many cases the wiring installations, made at the tenants' own expense, was of a very inferior standard. Councillor Prouse, chairman of the Housing Committee, moving the "no action" recommendation, referred to the almost insurmountable complications. A member asked what were the complications? Were they that the people who had put in electric installations for themselves would be claiming rebate? If there were any of those tenants still in the houses they would have no standing in law for such claims, he maintained. If the installations were not up to the required standard, the city might be running the risk of fire in the houses. Councillor Prowse, in conclusion, said it was not just a case of 94 houses. If the Council were going to do anything at all they would need to improve the other 160 houses which were partly lit by electricity.

Eire

The Electricity Supply Board has recently put into operation a new load dispatch office which provides centralised control of its entire power supply system. The office is housed in a new building behind the Board's head offices in Lower Fitzwilliam St, Dublin. Engineer-in-charge of the control room is Mr F. R. Warbrook, A.M.I.E.E.

South Western

An experiment in supplying mains to remote farms by the phase-neutral system, is being carried out in certain areas by the South Western Electricity Board. The experiment involves a system of high-voltage o.h. wiring designed by Mr G. T. Garwood, the Board's Devon sub-area manager. Mr R. T. Upton, the East Devon district manager, in whose territory the present experiments are being carried out, has said that whereas it used to cost £475 for an average length of 1,000 ft. of overhead h.v. cable under the normal system, the cost under the new system was only £320.

LIGHTING SCHEMES

Bromley (Kent). The Council is seeking M.o.T. consent to spend £52,000 next year on improving street lighting.

Leicester. The Watch Committee recommends the expenditure of £11,000 on street lighting for secondary roads on council housing estates.

Norton-Radstock. The U.D.C. has received consent to borrow £14,500 for sodium street lighting at Midsomer Norton and Westfield.

QUESTIONS IN PARLIAMENT

Russia's Atomic Power Station

THE Minister of Works was questioned last week about Russia's claim to have completed the first atomic power station. Sir David Eccles told Mr A. W. Lewis that the statement clearly referred to a pilot plant. The U.K. efforts in that field had been directed mainly to the erection of the full-scale plant being built now at Calder Hall. Mr Lewis also asked whether Russia had been approached to share their knowledge with Britain on a reciprocity basis, but Sir David said he had nothing to add to the Prime Minister's statement last month.

Factory Inspectorate

ONE graduate in chemistry had accepted an appointment as a factory inspector in response to the Ministry of Labour's advertisements for such applicants during the latter part of last year, Mr Harold Watkinson said last week. Asked if this did not indicate the need for better salary scales, he said, the scales were under consideration at present and it would not be proper for him to comment.

Nationalised Industries

THE B.E.A. and N. of Scotland Hydro-Electric Board were among the seven nationalised industries named by the Prime Minister as falling within the ambit of the Select Committee on Nationalised Industries. Others were B.O.A.C., British European Airways, N.C.B., Gas Council, and British Transport Commission.

V.H.F. in Wales

FOLLOWING the recent announcement concerning the establishment of nine new very high frequency broadcasting stations in various parts of the U.K., Mr C. Hughes asked last week what sites in N. Wales were included in the B.B.C.'s applications. Mr D. Gammans said the full plan included three stations for Wales. The station in the West had been approved and the Television Advisory Committee had been asked to make recommendations about the remaining proposals.

U.S. Contracts

REPLYING to Mr D. Jay last week the President of the Board of Trade said he had not received any reply from the U.S. Government yet concerning the award of contracts for the Chief Joseph Dam project to U.S. firms instead of the British company. He understood, however, that one may be received in the near future. The Minister told Mr G. de Freitas that the Government was not always aware of cases where British firms were unsuccessful in securing American contracts. They did know of three cases in the past three years where the U.K. bid was the lowest and fully compliant. In each case representations had been made.

Cable Monopoly

LATEST position in discussions with the C.M.A. and Covered Conductors Assoc. folowing the report of the Monopolies Commission on insulated electric wires and cables was given by Mr D. Sandys on Friday. It will be recalled that in May the Minister said that subject to two modifications the Associations had been asked to give assurances that they would comply with the Commission's conclusions. Last week the Minister said the Associations had given those assurances and consequently an order under Section 10 of the Monopolies Act would not have to be made. At the same time the Associations had protested that their pricing and distribution practices had in no way operated against public interest.

Royal Commission Reports

IT WAS suggested by Mr G. Williams that when recommending the appointment of a Royal Commission, at the same time the date for the submission of their reports should also be stipulated. Sir David Maxwell Fyfe explained that the terms of reference invariably asked for a speedy report, but the time any Commission might have to take to conduct their enquiries could not be accurately forecast. Attention was usually drawn to any special urgency about the whole or part of a particular investigation, he said, and the Commission can always reports its proceedings from time to time.

COMPANY ACTIVITIES

SIR HARRY RAILING, chairman of General Electric, in the annual report confirms that the company's recovery last year was due to higher turnover, though profit margins had to be reduced. As regards exports, sales of consumer goods reached new records, as I anticipated, but the outlook particularly in relation to capital goods is now being affected seriously by foreign competition. Sir Harry complains that the engineering wages award and other higher costs could not be recouped in the export market as they had to compete with goods produced by foreign companies paying lower wages for longer hours. Nevertheless, Sir Harry, ably assisted by Leslie Gamage, considerably improved the group's working capital position. The 1952/3 recession meant tying up too much money in stocks, which amounted to over £38 millions at the end of March 1953. These have now been reduced to more manageable proportions of £34 millions. This in turn has allowed the cash position to be strengthened. The net bank borrowing, previously £2·8 millions, has now been converted into a net cash position of £454,000, a change-over of just over £3¼ millions. Substantial as this improvement is, it still leaves the liquid asset figure well below the £5¼ millions which prevailed before 1952/53.

The increased competition in home and overseas markets, enforcing narrower profit margins, is probably the chief influence affecting the decline in trading profits of Dubilier Condenser Co. For the year to 31 Mar. last, they fell from £420,000 to £353,000. Most of the company's production goes to the active radio and television market and it can be presumed that turnover was at least well maintained. The current year should see results from the company's research into costs-saving methods. Fortunately, the tax cushion absorbed a considerable proportion of the trading profits' decline, and the net profit is only £3,000 down at £110,000. Tax charges which were £61,000 lower at £180,000 included £33,000 for E.P.L. On that basis the maintained 25% Ordinary dividend is covered almost 4½ times.

It was in Jan. last that Mr Jules Thorn, chairman and managing director of Thorn Electrical surprised the trade with a reduction in "Ferguson" TV prices. I was most impressed, after visiting the Enfield factory at that time, at the manifold activities taking place in this organisation. So that I am not altogether surprised to see profits shooting through the £1 million mark for the first time. The actual figure is £1,054,300 which compares with £779,300 last time. This is, of course, an all-time record. It is nearly ten times greater than profits 8 years earlier. Dividend goes up from 12½% to 20% which brings it back to the same level before the 100% bonus a couple of years back. Mr Thorn is not very bonus-minded at the moment. For he is concentrating on building up what will one day be a much bigger business. Only last week he arranged the issue of £500,000 5½% Unsecured Loan stock.—*From our City Correspondent.*

Cables Investment Trust

It is proposed to increase the capital to £5 millions by creating 100,000 Ordinary £10 shares and to offer 50,000 Ordinary shares at par to existing stockholders and to place privately £1 million of 4% Unsecured Loan Stock 1967-69. The final dividend for the year ended 30 June last is 6% (5%) making a total of 9% (8%). Group net profit for the year is £229,228.

Dubilier Condenser Co. (1925) Ltd.

In addition to again paying a dividend of 25% in respect of the year ended 31 Mar. last, it is proposed to capitalise £43,102. 10s. in a one-for-four scrip issue. Trading profits for the year, including tax certificate interest, amount to £353,000, compared with £419,639 for the previous year. The net profit is £110,429 (*£113,009*).

East African Power and Lighting Co.

Group profit for the year ended 31 Dec. last, is £438,279 (compared with £301,983 for the previous year), after allocating higher depreciation provision. The final dividend is 4% on the larger capital making a total of 7% for the year.

General Electric Co. Ltd.

In his notes accompanying the full accounts for the year ended 31 Mar. last, Sir Harry Railing, chairman, states that the improvement in the profit figures (shown in our table) was mainly due to the increased turnover achieved both in capital and consumer goods, although profit margins had to be reduced in many cases for both classes of goods. The order book at the end of the financial year was still satisfactory, but the future outlook as regards capital goods is increasingly affected by foreign competition. The improvement in the demand for consumer goods has materially helped the company's competitiveness in the overseas markets, he adds. Total shipments abroad created a new record. In spite of the increase in turnover, it has been possible to reduce the value of stocks and work in progress by over £3 millions to £34,288,107. Current assets total £54,120,359 while current liabilities are listed at £19,456,071 (*£22,215,351*). Notable is the reduction in the bank overdraft from £4,349.966 to £998,741 at 31 Mar. last.

Year to 31 Mar.	£ Trading Profit	£ Net Profit*	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	6,021,980	1,709,404	66	17½	86/–	72/–
1951	7,424,716	1,978,039	81	22½	99/6	81/3
1952	8,617,275	2,091,114	69	22½†	46/1	35/9
1953	6,519,615	1,266,054	17	11¼	46/–	36/3
1954	8,264,047	2,364,345	34	12½	45/–	37/6

*Available for the parent company.
†Plus 100% capital bonus.

Globe Telegraph and Trading Co. Ltd.

With a profit, after tax, of £275,370 for the year to 30 June last (nearly £45,000 more than before), the total distribution is raised by 1% to 9%, with a final dividend of 6% (5%). The directors have under consideration the question of the issue of further shares to stockholders.

Hick, Hargreaves and Co. Ltd.

The works have continued in full production throughout the year and are fully occupied with a heavy order book which exceeds £4 millions sterling, Mr W. D'Arcy Madden, chairman and managing director, stated at the meeting last week. The heavy-bay extension to the engineers' shop will be in commission by the end of this year and will enable the handling of contracts for condensing plants of 120 MW and 200 MW which will be required by the B.E.A. in the near future. Orders have been received for auxiliary equipment for the first atomic power station in this country, he added.

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	291,223	111,782	85	10	46/6	37/6
1951	347,949	129,970	86	15*	61/3	39/7
1952	369,567	135,096	89	20	66/–	51/6
1953	473,244	160,488	101	20	84/4	63/9
1954	529,338	200,320	72	20†	77/–	54/8

*Plus 20% capital bonus.
†Plus 50% capital bonus.

James Howden and Co. Ltd.

Consent of the Treasury has been received to the proposed 100% scrip bonus. The issue involves increasing the authorised capital from £700,000 to £1,500,000 and capitalising £546,000 of general reserves.

Murex Ltd.

Group profit for the year ended 30 April last, after all charges except taxation, is £657,000 (*£705,000*). The final dividend is 9%, making a total of 15%.

Pirelli-General Cable Works

The dividend is again of 8% plus bonus 12% for the year to 31 Mar. last. Trading profit for the period is £1,274,147 (*£1,879,782*), and the net profit, after taxation, etc., is £608,888 (*£810,043*).

Thorn Electrical Industries Ltd.

Group trading profit for the year ended 31 Mar. last amounted to £1,054,348, compared with £771,292 in the previous year. Deducting all charges, including depreciation of £206,492 (*£148,688*) and taxation of £462,740 (*£324,173*), the net profit is £315,566 (*£223,259*). The Ordinary dividend is raised by 7½% to 20%.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

6 Aug.—Heckmondwike U.D.C. Installation in old people's dwellings in Strawberry Sq.—See 15 July issue.

6 Aug.—Swansea T.C. Installation at Fforest Hall primary school.—Advertised in 22 July issue.

7 Aug.—Inverness. Installation in 24 houses on Beauly scheme.—See 29 July issue.

7 Aug.—Pwllheli T.C. Installation for auditorium of Town Hall.—Advertised in 8 July issue.

9 Aug.—Antrim. Electrical installation in 108 houses in Crumlin Rd. N. Ireland Housing Trust, 12 Hope St, Belfast. Deposit 10s.

9 Aug.—Dublin T.C. Telephone cables with accessories, etc.—See 29 July issue.

9 Aug.—Kidderminster T.C. Lighting and power installations, in the Retail Market, High St.—Advertised in 8 July issue.

10 Aug.—Belfast T.C. Supply and erection of passenger and goods lift at Ardoyne Depot (Form 971). Transport Dept., Sandy Row Depot.

10 Aug.—Blackpool T.C. Steel poles, brackets, bases and cast finials.—Advertised in 22 July issue.

11 Aug.—Londonderry. Installation in Model primary school.—See 29 July issue.

11 Aug.—Middleton T.C. Sodium discharge lighting units along Hollin Lane.—See 29 July issue.

11 Aug.—Romford T.C. Concrete columns and lanterns for sodium street lighting conversion.—See 29 July issue.

12 Aug.—Harrow T.C. Sodium lamps, lanterns and control gear for improved lighting in certain roads.—See 29 July issue.

12 Aug.—Manchester T.C. Installation in 30 houses and flats at Blackley, and 98 flats at Wythenshawe.—Advertised in 29 July issue.

13 Aug.—Belfast T.C. Replating cells of storage battery at East Bridge St station.—Advertised in 22 July issue.

14 Aug.—Aberdeen. Supply of electrical fittings during year from 1 Oct. for Harbour Commissioners. Harbour Engineer, 15 Regent Quay.

14 Aug.—Dagenham T.C. Group B street lighting units etc. in 10 roads.—See 22 July issue.

14 Aug.—Failsworth U.D.C. Street lighting columns, with sodium discharge lamps, lanterns, etc., in Broadway.—See 29 July issue.

14 Aug.—Southport T.C. Complete automatically operated electrically driven vertical spindle axial flow-type pumping unit for Crowland St Station.—See 29 July issue.

14 Aug.—Waterford. Supply and installation county home, Dungarvan, and county hospital, Waterford, of a Mona-Jet burner; an electrically driven and automatically operated boiler feed pump; and an electrically-driven sod-breaker or macerator. Ed. Ralph Ryan, consulting engineer, 1 Montpellier Terr, Galway. Deposit £3. 3s.

16 Aug.—Willesden T.C. Relighting Brentfield Rd, Manor Park Rd, and part of Chamberlayne Rd, by sodium vapour discharge lighting. Applications for inclusion on approved list of contractors by above date to Town Clerk, Town Hall, Dyne Rd, N.W.6.—Advertised in this issue.

16 Aug.—Bradford T.C. Electrically driven vertical spindle centrifugal pumps for two stations at Tong.—See 22 July issue.

16 Aug.—Denton U.D.C. Street lighting conversion units for attachment to existing gas columns.—See 15 July issue.

16 Aug.—Exeter T.C. Supply and erection of vertical spindle electric pump of 30,000 g.p.h. capacity at Intermediate Reservoir. City Engineer, 7 Southernhay West.

16 Aug.—Manchester T.C. Installation at Poundswick grammar school.—Advertised in 15 July issue.

16 Aug.—Nelson T.C. Provision and installation of equipment for illumination of six pedestrian crossings. Borough Engineer and Surveyor, Town Hall.

16 Aug.—Newmarket U.D.C. Partial wiring of 42 houses in New Chevely Rd, Stamford St, and The Rows. Architect, P. D. Lees, Severals Hse, Bury Rd.

17 Aug.—Belfast. Electrical heating and ventilating at civil defence sub-control centres. Ministry of Finance, Room 103, Law Courts Building, May St.

17 Aug.—Eire. Supply at Skerries of one electrically-driven compressor unit. Apply to Sanitary Services Dept., 6 Parnell Sq, Dublin.

19 Aug.—Belfast T.C. Boiler feed pumps for first extension of Power Station West.—Advertised in 1 July issue.

20 Aug.—Esher U.D.C. Electrically driven float-controlled centrifugal pump, at Cobham sewage works.—See 29 July issue.

20 Aug.—Neath T.C. Steel and concrete columns, equipment and wiring along A.48.—Advertised in 29 July issue.

21 Aug.—Castlebar (Eire). — Numerous items of machinery for Machinery Yard.—See 22 July issue.

23 Aug.—Derby T.C. Supply, erection, etc., of columns, brackets and lanterns along part of Ashbourne Rd (A.52). M. L. Francis, Borough Engineer and Surveyor, Council Hse.—Advertised in this issue.

23 Aug.—Louth (Lincs.) R.D.C. Two electrically operated booster pumps and auxiliary equipment in Horncastle Rd station.—See 29 July issue.

23 Aug.—Sedgley U.D.C. Conversion of 20 gas columns to electricity with 80 W mercury fluorescent lighting in class B along two roads. W. M. Jones, Engineer and Surveyor, The Limes, Dudley Rd.

23 Aug.—Spilsby (Lincs.) R.D.C.—Centrifugal pumps and ejectors for crude sewage, with electric motors, switchgear, etc. at eight pumping stations.—See 22 July issue.

23 Aug.—Stepney B.C. Electric lighting and power points in Cephas St, and Doveton St housing scheme. Borough Engineer and Surveyor, 227/233 Commercial Rd, E.1. Deposit £2. 2s.

23 Aug.—Ventnor U.D.C. Provision of main cables from shoreward end of Pier to new superstructure at Pierhead, and installation of switchgear, wiring and supply electrical equipment. Architect, Basil L. Phelps, 85 High St, Shanklin.

25 Aug.—New Mills (Lancs.) U.D.C. Conversion of 110 gas street lamps to electricity etc.—See 22 July issue.

25 Aug.—Wandsworth B.C. Repair of about 700 time switches.—Advertised in 15 July issue.

26 Aug.—Belfast T.C. Supply, erection at Power Station West of portable fire fighting appliances. Tender form N.1519. Merz and McLellan, consulting engineers, Carliol Hse, Newcastle-on-Tyne. Deposit £5. 5s.—Advertised in this issue.

27 Aug.—Bridgwater T.C. Supply, erection, etc., of electrically driven centrifugal pump, for Ashford Waterworks. Borough Engineer, Town Hall.

27 Aug.—Dublin. Electric heating installation at 34 Molesworth St, for Commissioners of Public Works. J. Tyrrell, Secretary, Office of Public Works.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 112 queries answered this week

Dog trimming clippers, makers of? S.B.C.—Cooper-Stewart Eng. Co., Ltd., Stewart Works, Works Rd, Letchworth, Herts; Wolseley Sheep Shearing Machine Co., Ltd., Electric Ave, Witton, Birmingham; John A. Fransen Ltd., 6 Ryefield Cres, Joel St, Northwood Mills, Middlesex.

"Pelton" sterilisers, repairers of? T.B.C. —S. S. White Co. of Gt. Britain Ltd., 126 Gt. Portland St, W.1.

"Columbine" irons, makers of? Y.E.B. —C.V.A. Jigs, Moulds and Tools Ltd., Portland Rd, Hove 3.

"Solectray" plate warmers, makers of? W.J.F.—Bratt Colbran Ltd., Lancelot Works, Lancelot Rd, Wembley, Middx.

"Autolec" potato peelers, suppliers of? S.E.E.B.—Kitchen Machines Ltd., 7 Sicilian Ave, W.C.1.

"Neolux" products, makers of? A.C.E. —Lighting fittings are made under this name by: Dernier and Hamlyn Ltd., 23 Newman St, W.1.

Fire bell with 240 V motor started by push button to give 30 second intermittent ringing of low voltage bell, makers of? S.B.C.—Walter Jones and Co. (Engrs.) Ltd., 36 Newlands Park, S.E.26, state that they should be able to assist.

27 Aug.—Leeds T.C. Electrically-driven multi-stage centrifugal pumps with electric motor and switchgear.—See 8 July issue.

27 Aug.—Leeds. Underground cables and lighting at Castle Hospital, Cottingham.—See 22 July issue.

30 Aug.—Basingstoke (Hants). Supply of electric lamps in six months from 1 Oct. for Park Prewett Hospital Management Committee. Apply to Fredk. Hales, Group Secretary.

30 Aug.—Leeds. Installations at Scalebor Pk Hospital, Burley-in-Wharfedale.—See 22 July issue.

30 Aug.—Ramsbottom U.D.C. Concrete columns and other equipment for sodium lighting in Bridge St.—See 22 July issue.

31 Aug.—Ashbourne U.D.C. Supply and erection of 145 150 W tungsten lamps with standards in stage 3 of public lighting scheme. Engineer and Surveyor, King Edward St. Deposit £1. 1s.—Advertised in this issue.

31 Aug.—Eastbourne T.C. Maintenance and periodic testing of 12 air raid sirens for three years from 1 Oct. F. H. Busby, Town Clerk, Town Hall.

31 Aug.—Galashiels T.C. Supply, erection and wiring of 20 units for mercury vapour discharge lighting in Island St, Wilderhaugh, and King St. R. G. Nicholson, Lighting Inspector, Burgh Chambers.

31 Aug.—Mexborough (Yorks) U.D.C. Supply, erection, etc., of duplicate booster pumps with motors and switchgear. Council Offices, Adwick Rd; or from Silcock and Simpson, consulting engineers, 10 Park Row, Leeds. Deposit £5.

3 Sept.—Co. Tyrone. Installation at Dungannon secondary intermediate schools.—See 8 July issue; closing date has been altered.

13 Sept.—Dublin T.C. Installation in Technical School for Girls in Crumlin Rd.—See 29 July issue.

No date stated—Whippingham (I.o.W.). Installation of electric heating in St. Mildred's Church. Details from secretary of Parochial Church Council, E. K. H. Derham, Hildenley, Moresfield Rd, E. Cowes.

No date stated—N. of Scotland H.E. Board. Lighting, heating and auxiliary cabling installation for Torr Achilty power station. Merz and McLellan, 72a George St, Edinburgh. Deposit £2. 2s.—Advertised in this issue.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 3 August

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	234½	−1½	252
„ (3 months)	233½	−1½	—
LEAD, refined pig, min. 99·97% purity (cash)	92½	−2½	93½
„ (3 months)	91½	−2½	89½
TIN, refined, min. 99·75% purity (settlement)	745	−5	573½
„ (3 months)	741	−6	571½
ALUMINIUM, ingots 99·99·5%	156	—	150
ZINC, virgin, min. 98% purity (cash)	73½	+2	72½
„ (3 months)	74½	+1½	73
RUBBER No 1, RSS, spot (per lb.)	20½d.	−⅛d.	18½d.
„ c.i.f. basis, ports, Sept. (per lb.)	20½d.	−¼ d.	19d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	52	—	50½
Mild Steel Tape (0·014 in.)	40½	—	40

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

26 Aug.—South Africa. Tenders (P.O. 1637) invited for supply of total of 66,880 yd of P.V.C. wire for switchboards, to various specifications. Union Tender and Supplies Board, 291 Bosman St (P.O. Box 371) Pretoria. B.o.T. (Ref: ESB 18458/54).*

1 Sept.—Iraq. Supply of three 75 kVA transformers for Baghdad District Water Board, Rashid St. B.o.T. (ESB 18197/54).*

2 Sept.—Australia.—State Elect. Commission of W. Australia invites tenders (334A) for two 45,000/45,000/10,000 kVA 132/69/22 kV, star/star/tertiary delta transformers. Govt. Tender Board, 74 Murray St, Perth. B.o.T. (Ref.: ESB 18056/54).*

7 Sept.—Argentina. Construction of h.v. line, 244 kilometres long, to carry current from El Nihuil to towns of San Rafael and Mendoza. Tenders sought by Ministry of Industry and Commerce, Buenos Aires. B.o.T. (Ref.: ESB 17097/54).*

7 Sept.—Formosa. Taiwan Power Co. invites tenders (No. 902) for supply of turbine, speed governor, pressure regulator, oil supply system, butterfly valve, control equipment, penstock main valve, generator unit, switchboard, generator auxiliary panel. Co. is at 39 East Huo-Ping Rd, Taiper, Taiwan. B.o.T. (Ref.: ESB 18571/54).*

10 Sept.—Australia. Tenders (23/54) invited for supply of signal generation and injection equipment for substation. Documents from Chief Engineer and Manager, Dept. of Electricity, Kelvin Hse, Adelaide St, Brisbane, at 10s. 6d. a copy. B.o.T. (Ref.: ESB 18191/54).*

10 Sept.—New Zealand. Auckland Electric Power Board require 700 street lighting fittings for 250 W mercury vapour lamps, on 230 V a.c. supply. Chairman of Board, Queen St, Auckland, C.1. Deposit £100. B.o.T. (Ref.: ESB 18160/54).*

17 Sept.—Australia. Contract E.22/54 calls for supply of 33 kV and 11 kV submarine and underground cables, joints and terminators for Brisbane Dept. of Electricity. Documents from Chief Engineer and Manager of Dept., Kelvin Hse, Adelaide St, Brisbane, at 10s. 6d. a copy.

17 Sept.—Belgian Congo. Supply of electrical equipment, and of materials for and installation of electrical distribution network at Luluabourg Aerodrome. Copy of specification (No. 579) is at Belgian Embassy, 103 Eaton Sq, London, S.W.1.

17 Sept.—Portuguese W. Africa. Supply of electrically and hand operated overhead travelling cranes and conveyors. Value of contract £75,000. Deposit Esc. 150,000 (£1,875). Directorate General of Overseas Development. B.o.T. (Ref.: ESB 17979/54).*

11 Oct.—Tangier. Supply of electrical equipment and h.t. and l.t. installations, and public lighting in New Moroccan quarter at Rabat. La Regie des Services de l'Eau et de l'Electricite, 4 Rue Vermeer, 3 eme Etage, Tangier. B.o.T. (Ref.: ESB 18121/54).*

20 Oct.—India. Madras Electricity Dept. invites tenders (E.233) for outdoor and indoor switchgear for extensions to substations. Dept. of Electricity, Govt. of Madras. Rs. 25s. per copy. B.o.T. (Ref.: ESB 18182/54).*

Gazette Announcement

BANKRUPTCY ACTS

Application for Discharge

Gt. Grimsby. Montague J. Hatton, trading as Hatton and Hanna, contractors, at 128 Kingston Rd, New Malden, Surrey. Hearing fixed for 22 Sept. at Town Hall, Grimsby, at 10.30 a.m.

Contracts Placed

Hastings T.C. Supply of 61 flashing beacons, Revo Electric Co., Ltd.

Lyme Regis T.C. Installation of improved street lighting scheme, S. Western Electricity Board, £1,641.

Newcastle-under-Lyme T.C. Installation in houses on Clayton Lane estate, J. Bagguley and Son, £1,012.

Newcastle-on-Tyne T.C. Installation in Rutherford grammar school, T. Mitchelson (Electrical) Ltd., £11,148.

Peterborough. Renewal of cables at Memorial Hospital, Electrical Installations Ltd., £2,782.

Liverpool T.C. Supply of switchboard, for two box-circuits, a repeat circuit and battery charging facilities, with 36 street fire alarm boxes etc., Standard Telephones and Cables Ltd. £4,624.

Manchester T.C. Installation in 42 flats and 292 houses on Langley estate. A. J. Dyer and Sons Ltd.; rewiring laboratory at Daryhulme sewage works, E. M. Evans and Son Ltd.

Acton T.C. Supply of 119 refrigerators, Electrolux Ltd, £4,664; and their installation in flats on Vale estate, W. Johnson and Cole, £104.

Metropolitan Water Board. Manufacture, erection etc. of switchgear, control gear and ancillary equipment at Turnford station. Bellmos Co., Ltd., £1,390; same of electrically-driven low lift pump and other works at Barn Elm, Hawthorn Davey and Co., Ltd., £3,998; also six electric centrifugal pumping units, piping, motors, switchboard, control boards, etc., at Bexley station, W. H. Allen, Son and Co., Ltd, £41,167; cold cathode lighting fittings and lamps at New River Head, Crompton Parkinson Ltd, £1,315, and Courtney Pope (Electrical) Ltd, £462.

Middlesbrough T.C. Installations at Archibald and Ayresome Schools, J. Paterson and Co., £2,147.

Washington (Dur.) U.D.C. Installation in 70 houses. J. B. Wilson.

BUSINESS PROSPECTS

Home

Andover (Hants) T.C. Thirty-two dwellings to be built in Clarendon Ave, and tenders to be invited for 22 houses on Leigh Rd estate.

Accrington T.C. Erection of block of four shops with flats on Within Grove estate. Borough Engineer and Surveyor, Town Hall.

Airdrie T.C. Dean of Guild Court has approved plans for 90 houses in Imperial Drive.

Bangor (Down) T.C. Scheme proposed for erection of conference hall on approach road to the castle.

Banstead (Sur). Approval in principle given to erection of N. Tadworth Farm county secondary school, estimated to cost £105,851.

Basildon (Essex). Development Corpn. to erect six factories on industrial estate.

Battle (Sus) R.D.C. Erection of 14 houses and 16 flats at Asten Fields, North Trade Rd. Architect, A. H. Neave, 38 Mount St.

Bishop Auckland U.D.C. Loan sanction for £138,000 received for erection of 106 houses on Woodhouse Close estate.

Buckinghamshire. Aspro Ltd. proposing to develop about 7½ acres of land on Bath Rd by erection of factory.

Burntisland (Fife) T.C. Erection of 51 houses on Broomhill Crescent site approved.

Bute. Dept .of Education asked to approve plans for new Rothesay Academy to replace former building. Cost estimated at £240,000.

Cardigan T.C. Tenders likely to be invited soon for erection of 60 houses on Greenland Meadows site.

Chelmsford (Essex). Layout plans approved for 119 houses on West Belvedere estate.

Coatbridge (Lanark) T.C. Layout approved of 272 houses at Cuparhead.

Corby U.D.C. 140 houses to be built to complete sections 1 and 4 of Lodge Park estate.

Dumbarton. Dean of Guild Court has approved erection of workshops, offices etc in Castlegreen St for Scottish Gas Board. Cost estimated at £70,000.

Dunstable. New motor car factories in Luton Rd to cost about £40 millions. Commer Co. building £1 million plant.

Erith (Kent) T.C. Approval given to construction of underground Civil Defence control centre costing £13,081.

Eston (Yorks) U.D.C. Tenders may soon be invited for erection of 40 houses.

Grantham. Staff accommodation, central boiler house and three ward units to be added at Grantham and Kesteven General Hospital, for Sheffield Hospital Board. Messrs. Gleeds, 21 Victoria St, Nottingham, will probably be quantity surveyors.

Grimsby. John Bull Rubber Co. of Leicester, to build factory on Pyewipe industrial estate.

Hamilton T.C. Dean of Guild Court has approved plans for 100 houses in Udston Hill scheme.

Harrow T.C. Revised layout plans approved for 158 dwellings, 12 shops etc at Bushey.

Hastings. Plans submitted for reconstruction of soft drinks factory in Earl St for R. Fry and Co. Architect is K. F. Wray, 43 Gildredge Rd, Eastbourne.

Hull. Sketch plans for Health Centre on Bilton Grange Estate, estimated to cost £40,000, have been approved.

Inverness T.C. Layout plans approved for 174 flats at Springfield and Bught.

Islington. B.C. recommended to approve appointment of A. H. Baker and Partners, 100 Victoria St, S.W.1, as consulting engineers for rewiring and improved lighting scheme at West branch library.

Jarrow-on-Tyne T.C. Plans prepared for 56 houses in South Leam Lane. Approval received for 68 houses on same estate.

Kerridge (Chesh). W. Chapman, Dobson and Partners, of Pear Tree Hse, Jordon Gate, Macclesfield, are architects for proposed factory of Eric Britton and Co., Ltd., Ingersley Vale, Bollington.

Kirkburton U.D.C. All trades in erection of 36 houses in Lepton estate. C. Hickson, of Stocks, Sykes and Hickson, Council's Architects, 4 St Peters St, Huddersfield.

Lanchester (Dur) R.D.C. Erection of 28 houses and 12 bungalows at Hamsteels. Council's Engineer, Council Offices.

Manchester. Extensions to be made to factory in Altrincham Rd, Northenden, for H. G. Allcard and Co. Architects are J. H. Sellers and Son, 78 King St.

Motherwell. Plans approved for R.C. school at North Motherwell, estimated to cost £126,024.

Newcastle-on-Tyne T.C. Consultants to be appointed soon for first stage (£643,000) of the £2½ million scheme for erection of new town hall at Berras Bridge.

Northampton T.C. Erection of 3 flats and 4 maisonnettes in Kingsland Ave, 12 flats at Eastfield, and 52 maisonnettes and flats at King's Heath. Borough Architect, Guildhall.

Northamptonshire. New school to be built at Daventry; work starting next Spring.

North Riding. Next year's building programme will include eight new schools costing about £500,000. They are Redcar West modern, Stokesley grammar modern, Eston South Bank county junior, Leeming Northallerton R.A.F. station county primary, Colburn Catterick county primary, Thirsk grammar modern, Guisborough modern and Skelton county.

Macclesfield T.C. Erection of 171 dwellings at Hurdsfield. Borough Architect, 3 Jordongate.

Malden and Coombe (Sur) T.C. It is proposed to build 56 flats in Newhouse Close and 20 in Burlington Rd.

Ormskirk U.D.C. Planning approval sought for 134 houses on Scott estate.

Paisley. Plans passed for extensions to works at Glenfield for W. Fulton and Sons Ltd. Estimated cost £60,000.

Peterhead, Aberdeen T.C. 102 houses to be built in Catto Drive.

Poole. Provisional approval granted to Hamworthy Engineering Co., New Quay Rd, Hamworthy, for an office block and other buildings.

Radcliffe (Lancs). Sweetule Products Ltd. are to build light industrial factory and offices at Allens Green.

Reading T.C. Erection of St. Michael's primary school. Borough Architect, Town Hall.

Rickmansworth U.D.C. Construction of 82 dwellings on Berry Lane estate. Engineer and Surveyor, Council Offices.

Sedbergh R.D.C. Construction of 24 houses and 36 flats on Maryfell site. Council's Architect, T. Maldwyn Jones, 1 Queen's Sq, Lancaster.

Sheffield. Sketch plans of £60,000 outpatients' dept. at Children's Hospital approved by United Sheffield Hospitals Board. Work expected to begin next year on first stage of erection of foundry experimental station for British Steel Castings Research Association. Cost of this stage about £75,000.

Shildon (Dur) R.D.C. Thirty-eight houses proposed on Jubilee Fields estate. Sanction to borrow £49,091 sought.

Sligo (Eire) T.C. Plans being prepared for 110 houses at Cleveragh.

Southend-on-Sea. Approval received for erection of 50 houses in Philpott Ave.

South Shields. Work expected to start early next year on new county secondary school. Quantity Surveyor is J. S. Glover, 13 Winchester St.

Spalding U.D.C. Plans prepared by W. E. N. Webster of Spalding, for new town hall to be erected in Churchgate.

Stevenage. Major extensions at Alleyns' grammar school are estimated to cost about £197,162.

Stockton-on-Tees T.C. Erection of 39 houses and 66 flats at Portrack. Borough Architect, 28 The Square.

Stoke-on-Trent T.C. It is proposed to build county primary infants' school at Hall Green. Council recommended to apply to borrow £64,746.

Swansea T.C. Scheme proposed for three-tier reconstruction of the Market at a cost of about £1,517,500.

Totnes (Dev) R.D.C. Construction of 26 houses at Sanderspool Cross, S. Brent. Engineer and Surveyor, Council Offices, Higher Plymouth Rd.

Tottenham T.C. Plans approved for development of Hale area involving erection of 118 dwellings including 8-storey blocks of flats.

Wakefield. New factory to be built in George St for Close Asbestos and Rubber Co. Ltd., 5a Cheapside.

Wallsend. Erection of factory in Station Rd, proposed by R. N. Dodds and Sons Ltd.

Westminster. Scheme proposed for provision of traffic signals and pedestrian crossings at various points. Estimated cost £6,200.

Wetherby R.D.C. Erection of 4 bungalows and 28 houses at Hallfield. Architests, Needham, Thorp and White, 6 High Petergate, York.

Overseas

U.S.A. Mr Warmington of Warmington, Woodcock and Williams Inc., 423 So. 11th St, Minneapolis, wishes to contact U.K. suppliers of electronic items: industrial electronic devices, inter-communication systems, public address equipment and unusual electronic items.

Pakistan. Quotations from U.K. firms wanted for electric motors by Merchant Mohini Flour Mills Ltd., Factory Area, Sargodha. They require three 35 h.p. motors for flour milling section, one same for cotton ginning section and one for oil crushing section. Manufacturers should write to Mr Ghulam Mohd., Qureshi.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery Lane, W.C.2.

Swift S.M. (London) Ltd. 2/3 Norfolk St, W.C.2. Manufacturers of and dealers in domestic, household and general electrical and other equipment, etc. Nom. cap.: £500. Dirs.: R. D. Greig and W. G. E. Lee.

Vacfill Ltd., 7 Berkeley St, W.1. Mechanical, electrical, constructional and general engineers, and in particular to acquire, make and sell filling machine for bottles and other containers under trade mark "Vacfill." Nom. cap.: £5,000. Dirs.: to be appointed by subs. Subs.: J. M. Twin, Newhaven, Parsonage Lane, Bishops Stortford, Herts, and E. Barker, 340 Railway St, Nelson.

Bart Finance Co., Ltd., Elm Pk Court, Pinner, Middlesex. Buyers, sellers and letters on hire of radios, television, electrical equipment, etc. Nom. cap.: £5,000. Permanent dirs.: A. R. Thorp and Mrs E. B. Thorp.

Villa Tool & Manufacturing Co., Ltd., 61 Cape Hill, Smethwick 40. Manufacturers of and dealers in electrical apparatus, etc. Nom. cap.: £2,000. Dirs.: W. T. Riley and B. W. Walker.

H. G. Deacon Ltd., 254 Vauxhall Bridge Rd, S.W.1. Heating and ventilating engineers, etc. Nom. cap.: £1,000. Dirs.: H. G. Deacon and T. Stainton.

Door Control Ltd., 26 Mutley Plain, Plymouth. Manufacturers of and dealers in electrically operated doors, dynamos, motors, etc. Nom. cap.: £1,000. Dirs.: C. W. S. Williams, E. Narracott, and A. L. Johnson.

Electronics (Lincolnshire) Ltd., 106 Cleethorpe Rd, Grimsby. Manufacturers of precision electronic equipment for communications, industrial and domestic purposes, etc. Nom. cap.: £100. Permanent dirs.: J. A. Porter, J. B. Leigh, and F. C. Drury.

Thermal Equipment Ltd., 17 Hanover Sq, W.1. Engineers, etc. Nom. cap.: £100. Dirs.: J. E. G. Harwood, W. A. H. Kahn, and P. L. Temple.

Lompar Electronic Recording Co., Ltd., 52a Oxford Gdns, W.10. Nom. cap.: £100. Permanent dirs.: H. W. Lomas and E. E. Parry.

Jesse Hill Ltd., 56/60 Pritchett St, Birmingham 6. To take over businesses of Davis and Hill and The Vulcan Meter Co., both of Pritchett St, Birmingham. Manufacturers of and dealers in gas, electric and water meters, etc. Nom. cap.: £17,500. Dirs.: J. C. Hill and Mrs. M. H. Hill.

D. S. Wild and Co. Ltd., 27a, High St, South Norwood, S.E.25. Manufacturers of and dealers in refrigerators and cold storage machinery, etc. Nom. cap.: £100. Dirs.: D. S. Wild and R. Bertorelli.

K. R. Plowright Ltd., 4, Park St, Croydon, Surrey. Heating, ventilating and air-conditioning engineers, etc. Nom. cap.: £10,000. Dirs.: K. R. Plowright and Ingrid Plowright.

Andersay Engineering Co. Ltd., Thames St, Abingdon, Berks, Manufacturers of and dealers in domestic, household and general electrical and other equipment, including washing and cleaning machines, etc. Nom. cap.: £100. Dirs.: F. H. Gardner, L. Groom, R. T. Hornsby, J. A. Jephcott and W. Glass.

Turner Electrical Co. (Bradford) Ltd., Jacob St, Manchester Rd, Bradford. Nom. cap.: £1,000. Dirs.: W. Nicholls, C. Nicholls, W. G. Nicholls and F. Turner.

West and Cooke Ltd., 61, Nottingham Rd, Loughborough, Leics. Automobile electricians and dealers in automobile electrical equipment, etc. Nom. cap.: £5,000. Dirs.: C. West, H. Cooke and H. Wales.

Bone Electric Fences Ltd., Fisher St, Dudley Port, Staffs. Manufacturers of and dealers in electric fences and components and parts thereof, etc. Nom. cap.: £500. Dirs.: D. F. Smith, E. E. Smith and S. J. Bone.

Qualified Engineers Ltd., 28 Western Rd, Littlehampton, Sussex. General electrical engineers and contractors, etc. Nom. cap.: £1,000. Dir.: H. C. L. Barnett.

Telektron (Great Britain) Ltd. Hydraulic, pneumatic, electrical, mechanical, constructional, scientific and general engineers and designers, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Sir Lacey E. Vincent, Yellow Sands, Sea Way, Middleton-on-Sea; and W. T. Tregoning, Whitelands Farm, Ashington, Sussex.

Longstaff and Shaw Ltd., Danes Inn Hse, 265 Strand, W.C.2. Heating, gas supplies, ventilation, air conditioning, refrigeration and general engineers, etc. Nom. cap.: £1,000. Dirs.: J. S. Longstaff, H. P. B. Shaw and B. J. Ducker.

A. H. Andrews and Co. Ltd., 8, The Parade, Oxford Rd, Kidlington, Oxon. To take over business of heating and electrical engineers carried on as "A. H. Andrews & Co." at Kidlington. Nom. cap.: £4,000. Permanent dirs.: A. H. Andrews and Mrs D. M. Andrews.

Companies Incorp. outside G.B. which have established place of business within this country.

Mufulira Copper Mines Ltd. Selection Trust Building, Mason's Ave, Coleman St, E.C.2. Regd. in N. Rhodesia on 1 July, 1954, to acquire lands, farms, mines, mineral and other properties, and to enter into agreement with Rhodesian Selection Trust, Ltd., Bwana M'Rubwa Copper Mining Co. Ltd., and British South African Co. Nom. cap.: £10,000,000. Name of person authorised to accept service: Selection Trust, Ltd., Selection Trust Building, Mason's Ave, Coleman St, E.C.2.

Roan Antelope Copper Mines Ltd. Selection Trust Building, Mason's Av, E.C.2. Regd. in N. Rhodesia on 1 July, 1954, to acquire lands, mines, mineral and other properties, etc., and to enter into an agreement with Northern Rhodesia Co. Ltd., Selection Trust, Ltd., and B'wana M'Rubwa Copper Mining Co. Ltd. Nom. cap.: £10,000,000. Name of person authorised to accept service: Selection Trust, Ltd., Selection Trust Building, Masons Ave, Coleman St, E.C.2.

Rhodesian Selection Trust Ltd. Selection Trust Building, Mason's Av, Coleman St, E.C.2. Regd. in N. Rhodesia on 1 July, 1954, to acquire lands, farms, mines, mineral and other properties, etc., and to enter into an agreement with Selection Trust, Ltd. Nom. cap.: £5,500,000. Name of person authorised to accept service: Selection Trust Ltd., Selection Trust Building, Mason's Ave, Coleman St, E.C.2.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Pyrovac. 723,981. Class 7. Machines for drying the hair and the hands. Scottish Heat and Vacuum Ltd, Stanley Works, Abbot St, Arbroath, Scotland.

Cromp-Arc. 725,149. Class 9. Electrical arc welding and arc brazing apparatus. Crompton Parkinson Ltd, Netherfield Rd, Guiseley, nr. Leeds.

Erodux. 728,187. Class 9. Electrical apparatus etc. Wickman Ltd, Banner Lne, Tile Hill, Coventry.

Barpro. 729,198. Class 9. Switches and connectors. Barring Products (Leicester) Ltd, 48, Cank St, Leicester.

Pluvicor. 730,094. Class 11. Fitted ducts and tubes all being parts of apparatus for lighting, heating etc. British Tyre and Rubber Co., Ltd., Herga Hse, Vincent Sq, S.W.1.

Orthotron. 728,761. Class 10. Electrical apparatus for use in X-ray therapy. Metropolitan-Vickers Electrical Co., Ltd, 1/3 St Paul's Churchyard, E.C.4.

Histion. 728,799. Class 10. Electromedical apparatus for ionizing histamine. Antibody Products Ltd, 57 Bushey Grove Rd, Watford, Herts.

Duotherm. 278,408. Class 11. Heat pumps. Brentford Electric Ltd, Kidbrooke Park Rd, S.E.3.

Drygiene. 729,446. Class 11. Apparatus employing a heating element for use in drying or airing articles of textile materials. Bromwest Ltd, 159 Notting Hill Gate, W.11.

Kaolite. 728,252. Class 17. Electrical insulation materials. Steel Co. of Wales Ltd., Newport Division, Orb Works, Newport, Mon.

TRADE NOTES

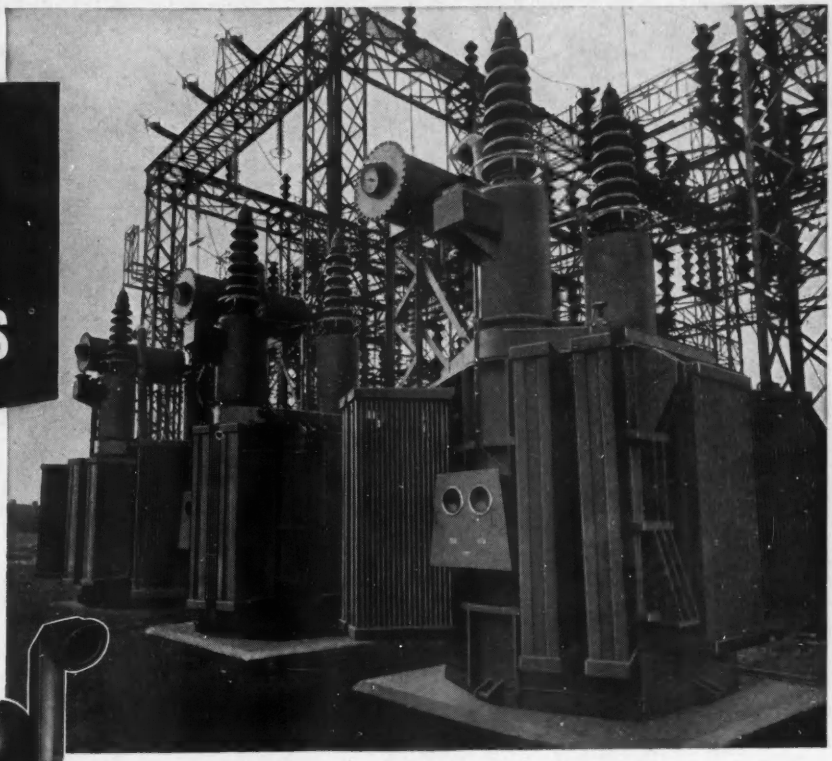
Amalgamation. J. and E. Hall Ltd. has announced its amalgamation with the Linde Canadian Refrigeration Co., of Montreal. The new organisation will operate under the title of the Linde Hall Canadian Refrigeration division of J. and E. Hall, and be under the managership of Mr J. H. C. McGarry, late general manager of Linde Canadian Refrigeration Co. Both Linde-Hall and J. and E. Hall's escalator and elevator branch in Canada will operate from premises in Montreal, Toronto, Vancouver and Winnipeg.

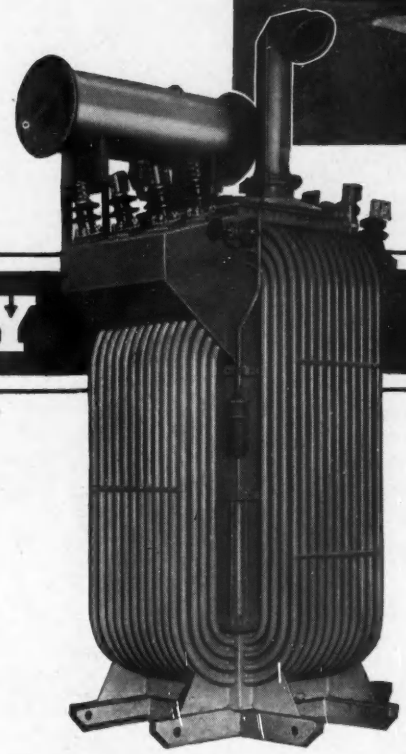
Agents. Ross, Courtney and Co., Ltd. have appointed the Wessex Wholesale Electric Ltd., as the sole selling agents and representatives for Cornwall, Somerset, Wiltshire, Herefordshire, Oxfordshire, Berkshire, Devonshire, Gloucestershire, Dorset, Monmouthshire and Hants.

Stockists. British Rawhide Belting Co. Ltd. now stock Akulon in rod form at their London and Liverpool warehouses.

Change of Address: The London address of Metal Industries Ltd. is now Universal Hse, 60/62 Buckingham Palace Rd, S.W.1. Tel: Sloane 5587, 5814 and 5618.

CURRENT LIMITING REACTORS





BY HACKBRIDGE

Whether magnetically or copper shielded, Hackbridge reactors embody the Hackbridge principle of unit construction: in either type the whole assembly constitutes a rigid structure of exceptional mechanical strength to withstand the largest electro-mechanical stresses met with under service conditions. Send for publication DB.18/1.

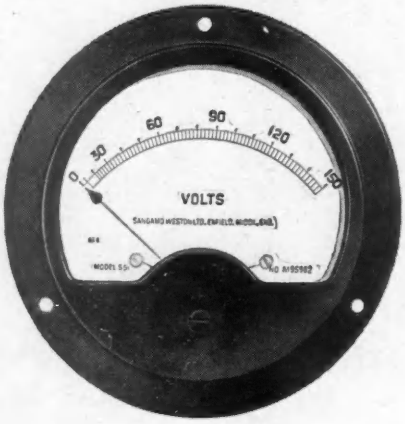
The illustrations show typical Hackbridge magnetically shielded reactors. Above: at Coventry Generating Station for introducing 18% reactance into the 90 MVA 132 kV. system; and below, for introducing a 3.75% reactance into a 30 MVA 6.6 kV. system.

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
Telephone: Walton-on-Thames 760 (8 lines) *Telegrams: "Electric, Walton-on-Thames"*

WESTON panel instruments

Both round and rectangular models of moving iron, moving coil, A.C. rectifier and H.F. thermocouple types are offered. In the range of rectangular instruments, which have been introduced to give the advantage of long, easily-read scales and to harmonize with rectangular panels, certain models are available with illuminated dials. Full particulars of types and ranges available are to be found in leaflets List Nos. W.1 and W.2, copies of which are available on request.

Rectangular panel instruments are available with scale lengths of 2·5″, 3·2″, and 4·2″. These offer the advantage of an increase in scale length of approximately 50% over their equivalent round models, for which they can be used as direct replacements using the same panel fixing holes.



Round models are housed in cases of 2″, 2½″ and 3½″ diameter and have scale lengths of 1·7″, 2·1″ and 2·8″ respectively.

Larger instruments, both round and rectangular and for switchboard or panel mounting, are also available. These have scale lengths of 6″ and 6¼″ respectively.

SANGAMO WESTON LIMITED

Enfield, Middlesex · Tel: ENField 3434 (6 lines) & 1242 (6 lines) Grams: Sanwest, Enfield

Scottish Factory: Port Glasgow, Renfrewshire. Port Glasgow 41151
Branches: London, CHAncery 4971 · Glasgow, Central 6208 · Manchester, Central 7904 · Newcastle-on-Tyne, Newcastle 26867
Leeds, Leeds 30867 · Liverpool, Central 0230 · Wolverhampton, Wolverhampton 21912 · Nottingham, Nottingham 42403
Bristol, Bristol 21781 · Southampton, Soton 23328 · Brighton, Brighton 28497

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

ASHBOURNE URBAN DISTRICT COUNCIL

PUBLIC LIGHTING SCHEME—STAGE III

THE Council invite Tenders from experienced firms for the supply and erection of the following approximate number of Street Lamps:

No. 145—150 W Tungsten Lamps complete with standards.

Plans may be seen, and General Conditions of Contract, Specification and Requirements of the Contract may be obtained from the Office of the Engineer and Surveyor, King Edward St, Ashbourne, Derbyshire, upon receipt of a deposit of £1. 1s., which will be returned on receipt of a bona fide tender not subsequently withdrawn.

Tenders with all documents should be enclosed in plain sealed envelope endorsed "Tender for Street Lighting: Stage 3" and should reach the Office of the undersigned not later than Tuesday, 31 Aug., 1954.

The Council do not bind themselves to accept the lowest or any Tender.

F. HUGH THOMAS,
Clerk to the Council.

Compton Offices,
Ashbourne, Derbyshire.
29 July, 1954. (K 624)

CITY AND COUNTY BOROUGH OF BELFAST
Electricity Department

ELECTRICITY (ESSENTIAL SUPPLIES) ACT (NORTHERN IRELAND) 1954

TENDERS are re-invited for the Supply, Delivery and Erection at Belfast Municipal Electric Power Station West of:

Portable Fire Fighting Appliances.

The installation is required to be complete by 31 Oct., 1954.

Form of Tender (N.1519), Conditions, Specification and Drawings, in quintuplicate, may be obtained from Messrs Merz and McLellan, Consulting Engineers, Carliol House, Newcastle upon Tyne 1, on payment of a deposit of Five Guineas which will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies of the contract document may be obtained at One Guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in quadruplicate, in sealed envelope marked "Tender for Portable Fire Fighting Appliances, Electricity Department" and endorsed with the name and address of the tenderer, must be addressed to the Town Clerk, City Hall, Belfast, so as to reach him not later than 4 p.m. on Thursday, 26 Aug., 1954.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

EYRE GORDON,
Chairman.
Northern Ireland Joint
Chichester House, Electricity Committee.
Chichester St, Belfast.
30 July, 1954. (K 627)

BOROUGH OF WILLESDEN

TENDERS FOR STREET LIGHTING

THE Council will shortly undertake the relighting of Brentfield Rd, Manor Park Rd and Chamberlayne Rd (part) in the Borough by Sodium Vapour Discharge Lighting.

Firms and persons interested in the supply and/or erection of the necessary concrete columns, lanterns and electrical equipment are invited to apply for inclusion of their name in the Council's Approved List of Contractors for this work and should submit with their application details of similar works recently undertaken so as to reach the Town Clerk, Town Hall, Dyne Rd, N.W.6, by not later than Monday, 16 Aug., 1954.

R. S. FORSTER,
Town Clerk.
30 July, 1954. (K 626)

COUNTY BOROUGH OF DERBY

TENDERS FOR TRUNK ROAD STREET LIGHTING—ASHBOURNE ROAD A.52 (PART)

TENDERS are invited for the provision, erection and putting into service of Street Lighting Columns, Brackets and Lanterns on the above trunk road.

Specifications, schedules and forms of tender may be obtained from Mr M. L. Francis, Borough Engineer and Surveyor, Council House, Derby.

Plans and conditions of contract may be inspected at the same office during normal office hours.

Tenders endorsed "Trunk Road Street Lighting" in sealed envelopes and bearing no name or mark to indicate the sender, must reach the undersigned not later than 23 Aug., 1954.

The Council do not bind themselves to accept the lowest or any tender.

G. H. EMLYN JONES,
The Council House, Town Clerk.
Derby.
July 1954. (K 597)

BOROUGH OF NEATH

STREET LIGHTING, TRUNK ROAD, A.48

TENDERS are invited in connection with the provision of Group "A" Electric Lighting to approximately 3½ miles of Trunk Road. The lighting will be mainly of the sodium type and tenders should be submitted on the following basis:

(*a*) Supply and delivery of all electrical equipment.
(*b*) Supply and erection of steel and concrete columns and fixing and wiring of electrical equipment offered in own tender;
(*c*) Supply and erection of steel and concrete columns and fixing and wiring of electrical equipment of another supplier.

Contract Documents can be obtained and plans viewed at the office of Mr D. Bailey, A.M.I.C.E., Borough Engineer, Gwyn Hall, Neath, on payment of a deposit of £2. 2s. which will be refunded on the submission of a bona-fide tender and the return of all Contract Documents.

Tenders must be sent to the undersigned not later than 20 Aug., 1954, in a sealed

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envelope endorsed Trunk Road Street Lighting, and bearing no mark which will identify the sender.

The Council reserves the right not to accept the lowest or any tender.

A. E. I. CURTIS,
Town Clerk.

Town Clerk's Office,
Town Hall, Neath.
July, 1954. (K 573)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
Glascarnoch-Luichart-Torr Achilty Project

ELECTRIC LIGHTING, HEATING AND AUXILIARY CABLING INSTALLATION FOR TORR ACHILTY POWER STATION AND DAM

TENDERS are invited for the above installation. Copies of the Tender Document may be obtained on application, with a cheque for £2. 2s. (returnable), to the Engineers, Messrs Merz and McLellan, 72A George St, Edinburgh 2.

The Board do not bind themselves to accept the lowest or any Tender.

W. D. D. FENTON,
16 Rothesay Terr, Secretary.
Edinburgh 3.
29 July, 1954. (K 625)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments, which are superannuable and subject to medical examination:

SECTION ENGINEER in the Southport District of the Board's No. 1 Sub-Area. Salary £649/£681 p.a. (N.J.B. Class E, Grade 7).

Applicants should have experience in the construction, operation, and maintenance of high voltage systems and possess the technical qualifications to enable them to become Chartered Electrical Engineers.

Special application forms obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3.

SECOND ASSISTANT ENGINEER (Buildings) at the No. 3 Sub-Area Headquarters at Chester. Salary £764/£796 p.a. (N.J.B. Class J, Grade 8).

Applicants should have experience of the design, construction, and maintenance of buildings and associated works and the preparation of drawings and specifications. Possession of H.N.C. in Building or similar qualification advantageous.

Applications should be made on forms obtainable by written request from the Manager, No. 3 Sub-Area, Electricity House, Newgate St, Chester.

Closing date for both appointments: 21 Aug., 1954. (K 590)

BRITISH ELECTRICITY AUTHORITY
North West, Merseyside and N. Wales Division

APPLICATIONS are invited for the appointment of SHIFT CHARGE ENGINEER at the Connah's Quay Power Station, Connah's Quay, North Wales. Salary £729/£758 per annum Grade 7, Class "G," N.J.B. Superannuable and subject to medical examination.

Applicants should preferably be Associate Members of the Institution of Electrical or Mechanical Engineers or possess equivalent technical qualifications, have had a good general and technical education, and be experienced in the shift operation of a modern power station.

Application Forms may be obtained from the Divisional Controller, Beaconsfield Rd, Woolton, Liverpool. Closing date: 18 Aug., 1954. (K 591)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

THE following amends the Advertisement previously issued for Vacancies Nos. 1/54, 2/54, 3/54.

TWO—SENIOR DRAUGHTSMEN (CIVIL)
CONSTRUCTION DEPARTMENT
Vacancy No. 112/54/ET

Candidates should have experience in the preparation of detail drawings and in the design of one or more of the following subjects:

Reinforced concrete structures.
Piled and slab foundations for heavy components.
Cable subways, Bridges and Culverts.

The salary will be in accordance with Grade 4 (£671/£780 per annum) or Grade 5 (£567/£671 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications 12 Aug., 1954.

TWO—SENIOR DRAUGHTSMEN
(MECHANICAL)
CONSTRUCTION DEPARTMENT
Vacancy No. 113/54/ET

Candidates should have experience on one or more of the following:

(i) Design and layout of Power Station equipment, including turbo-alternators, boiler plant, coal and ash plant and general station auxiliaries.
(ii) H.P. and L.P. steam and feed pipework. Condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

The salary will be in accordance with the National Joint Board Agreement Grade 4 (£671/£780 per annum) or Grade 5 (£567/£671 per annum) of Schedule D according to experience.

Closing date for receipt of applications 12 Aug., 1954.

FOUR—SENIOR DRAUGHTSMEN
(ELECTRICAL)
CONSTRUCTION DEPARTMENT
Vacancy No. 114/54/ET

Candidates should have experience in the preparation of layouts and diagrams for the installation of E.H.T. and L.T. switchgear, transformers, E.H.T. and L.T. cables; knowledge of protective gear systems would be an advantage.

The salary will be in accordance with the National Joint Board Agreement, Grade 4 (£671/£780 per annum) or Grade 5 (£567/£671 per annum) of Schedule D according to experience.

Closing date for receipt of applications 12 Aug., 1954.

The above appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy No.

L. F. JEFFREY,
Divisional Controller.

23 July, 1954. (K 594)

BRITISH ELECTRICITY AUTHORITY
South West Scotland Division

ASSISTANT SHIFT CHARGE ENGINEER
KILMARNOCK

APPLICATIONS are invited for the position of Assistant Shift Charge Engineer at Kilmarnock Power Station.

The post will be superannuable and the salary in accordance with Class F, Grade 9 of the National Joint Board Agreement, will be at the commencing rate of £607 per year. Applicants should have attained the Higher National Certificate in electrical or mechanical engineering and have had power station control room experience.

Applications on Form AE.6 which may be obtained from the Divisional Office of the Authority, should be forwarded to the Divisional Secretary, 168 Broomhill Drive, Glasgow, W.1, before Monday, 16 Aug., 1954. (K 596)

ELECTRICAL TECHNICIANS

as shown below required by ZANZIBAR GOVERNMENT for one tour of 2—3 years on contract. Salary scale (including present temporary allowance of £192/£257 a year) £782 rising to £1,097 a year. Commencing salary according to qualifications and experience. Gratuity of 13½% of total basic salary drawn during contract. Outfit allowance of up to £60. Free passages. Liberal leave on full salary.

(*a*) INSTALLATION INSPECTOR (M2C/30666/EE). Candidates must have served an apprenticeship and hold the O.N.C. in Electrical Engineering or equivalent with not less than three years' experience in charge of construction and maintenance of domestic and small industrial installations. A thorough knowledge of I.E.E. regulations is essential.

(*b*) OVERHEAD LINESMAN (M2C/30667/EE). Candidates must have served an apprenticeship and hold the O.N.C. in Electrical Engineering or equivalent with not less than five years' experience of construction and maintenance of L.T. and H KV overhead lines and services.

(*c*) ELECTRICIAN (M2C/30668/EE). Candidates must have served an apprenticeship and hold the O.N.C. in Electrical Engineering or equivalent with not less than three years' experience in maintenance of domestic and industrial wiring installations, motors, household appliances and various forms of lighting equipment. Knowledge of refrigeration an advantage.

Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote the reference number stated against the post applied for. (K 592)

BRITISH ELECTRICITY AUTHORITY
South Western Division

GENERAL ASSISTANT ENGINEER (Protection) required in the Technical Department—Plymouth Region.

Superannuation Scheme. Salary, N.J.B. Class "AX/CX" Grade 8, £501—£675.

Applicants should possess qualifications leading to A.M.I.E.E. and have served with one of the leading electrical manufacturers. They should have an interest in protective gear design, generator and switchgear testing.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 16 Aug., 1954. (K 605)

SOUTH EASTERN ELECTRICITY BOARD

JOINTERS (EXTRA HIGH TENSION)
WORTHING DISTRICT

WAGES 3s. 9d. per hour for 44 hour 5-day week under N.J.I.C. Agreement.

Applications naming 2 referees to M. J. Mortimer, M.I.E.E., District Manager, Worthing District, SEEBoard, 56 Chapel Rd, Worthing, by 18 Aug., 1954.

ASSISTANT DISTRICT ENGINEER
SEVENOAKS DISTRICT

Salary £555 per annum under N.J.B. Class E, Grade 10. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems, preferably up to 33 kV. The position will entail standby duties.

Applications, naming 2 referees, to H. F. Gill, District Manager, SEEBoard, Electric Hse, West Hill, Oxted, Surrey, by 18 Aug., 1954.

FITTER (ELECTRICAL)
WORTHING DISTRICT

Wages 3s. 9d. per hour for 44 hour 5-day week under N.J.I.C. Agreement. Applicants should be experienced in the maintenance, erection, panel wiring, etc., of high voltage switchgear, transformers and substation ancillary equipment.

Applications, naming 2 referees to M. J. Mortimer, M.I.E.E., District Manager, Worthing District, SEEBoard, 56 Chapel Rd., Worthing, by 18 Aug., 1954.

A. L. BURNELL,
Secretary.
(K 604)

BRITISH ELECTRICITY AUTHORITY
Eastern Division

APPLICATIONS are invited for the following posts:

FIRST ASSISTANT STATION CHEMIST
LITTLE BARFORD GENERATING STATION

Salary Class G, Grade 9, £641/£667 per annum.

Applicants should preferably be qualified B.SC., or hold an equivalent qualification in chemistry, but other suitably experienced applicants will be considered if they are following a course of study leading to such a qualification.

Sound knowledge and experience of the work of a generating station laboratory are essential and some knowledge of the more specialised chemical aspects is desirable.

JUNIOR ENGINEER
LITTLE BARFORD GENERATING STATION

Salary Class G, Grade 16, £402; Grade 14, £491 per annum.

Commencing salary depending on qualifications and experience.

The duties of the successful applicant will include assisting in the Control Room on shift and other operation and investigation duties. Preference will be given to applicants who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

JUNIOR ENGINEER
WATFORD GENERATING STATION

Salary Class E, Grade 15, £390; Grade 14, £445 per annum plus London Weighting.

Commencing salary depending on qualifications and experience.

The duties involve assisting in the technical operation of boiler, turbine and electrical plant and form a suitable background for future promotion.

Previous experience with similar plant and technical training to Ordinary National Certificate standard or its equivalent will be advantageous.

Applications stating age, details of qualifications and experience should be sent to the Controller, British Electricity Authority, Eastern Division, Northmet Hse, Southgate, N.14, to arrive not later than 14 Aug., 1954.

W. N. C. CLINCH,
Controller.
(K 602)

SOUTHERN ELECTRICITY BOARD

DRAUGHTSMAN (CIVIL ENGINEERING)

NO. 2 (Newbury) Sub-Area. Salary N.J.B. Schedule D, Grade 6 (£433/£567 per annum). N.J.B. Conditions of Service.

Applicants should be capable of preparing drawings and making calculations, and have knowledge of building construction, steelwork and reinforced concrete structures.

The successful candidate will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, and returned to him not later than 20 Aug., 1954. (K 587)

NORTH WESTERN GAS BOARD
Manchester Group

ELECTRICAL SUPERINTENDENT
BRADFORD ROAD WORKS, MANCHESTER

APPLICATIONS are invited for the above pensionable appointment at a salary within Grade A.P.T. 12 (£765/£890 per annum).

Applicants should be preferably corporate members of the Institution of Electrical Engineers or have passed sections A and B or be exempt therefrom. They should have experience in the operation and maintenance of 2,500 kW, 6·6 kV alternators, 6·6 kV and 440 V distribution systems, electric motors and starters up to 500 h.p. at 6·6 kV, and the organisation of routine electrical maintenance on large gasworks and coke oven plants.

Detailed applications giving the names of two referees should reach the General Manager, North Western Gas Board (Manchester Group), Town Hall, Manchester 2, within 14 days. (K 595)

BRITISH ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of Service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance.

JUNIOR ENGINEERS (CONTROL)
BRUNSWICK WHARF GENERATING STATION

Vacancy No. 54/629

Duties include assisting in Main Control Room, with opportunity for gaining general knowledge of Power Station. Shift duties. Qualifications entitling to Graduate Membership of I.E.E. or I.MECH.E. an advantage. Salary—Class K, Grade 15/3=£572. 5s. p.a.

STATION CHEMIST
HACKNEY GENERATING STATION

Vacancy No. 54/630

This appointment also carries responsibility for Chemical Services to Islington, St. Pancras and Walthamstow Generating Stations. Applicants should possess B.SC. or equivalent qualification in Chemistry and have a thorough knowledge of power station practice relating to the examination of fuels, oils and waters. Candidates should preferably have held a similar post in a modern station and have experience in control of staff. Salary—Class H, Grade 7=£810. 12s. p.a.

FIRST ASSISTANT STATION CHEMIST
TAYLORS LANE GENERATING STATION

Vacancy No. 54/631

Candidates must have experience in a laboratory of a modern high pressure station and be fully conversant with the testing and analysis of fuels, oils and water. Salary—Class F, Grade 9=£637. 7s. p.a.

JUNIOR ENGINEERS

Vacancy No. 54/560

Junior Engineers required at various power stations in the London Area. Excellent opportunities for training and promotion to higher grades. Salary and conditions of service in accordance with N.J.B. Agreement.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, Generation Hse, Great Portland St, W.1, and be received within 14 days of this advertisement. (K 588)

THE NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF JUNIOR ENGINEER, SUB-AREA TECHNICAL ENGINEER'S DEPARTMENT, MANCHESTER

APPLICANTS should have received a technical education to H.N.C. level, and have served an engineering apprenticeship or received equivalent training. Duties include assisting in the preparation of schemes and estimates for extension of a large city network and associated protective gear and metering problems. Drawing Office experience will be an additional qualification.

Salary Scale: £402/£544 p.a., Grade N.22/18, N.J.B. Conditions.

Applications to Sub-Area Secretary, No. 1 Sub-Area, the North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 14 Aug., 1954.

APPOINTMENT OF SENIOR SALES REPRESENTATIVES, WIGAN AND BOLTON DISTRICTS

Duties include advising consumers on their premises on all matters normally concerned with Sales Development, i.e. tariff queries and apparatus sales for domestic and small commercial and industrial applications.

Experience in the application of electricity to agriculture and horticulture would be an advantage.

Salary Scale: £485/£545 p.a., Grade 2, N.J.C. Conditions.

APPOINTMENT OF DEMONSTRATOR, BURY DISTRICT

Applicants should be qualified to lecture and advise on the utilisation of electric cookers, washing machines, refrigerators, and other domestic appliances, and to give public demonstrations in Service Centres and at Exhibitions.

Preference will be given to applicants who hold the E.A.W. Diploma. If not already held, the successful applicant will be required to obtain such Diploma.

Salary Scale: £400/£490 p.a., Grade 1, N.J.C. Conditions.

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Applications for the above two posts to the Sub-Area Manager, No. 2 Sub-Area, The North Western Electricity Board, National Buildings, St. Mary's Parsonage, Manchester 3, by 14 Aug., 1954.

APPOINTMENT OF FOREMAN, DISTRICT INSTALLATION INSPECTION SECTION, STALYBRIDGE

Applicants must have had good practical experience in testing and inspecting all classes of electrical installations and they should have a first-class knowledge of Statutory and Non-Statutory Regulations obtaining in this class of work. They should have a knowledge of meter fixing and the connecting of all types of meters, together with a good general knowledge of general distribution technique.

Salary: £505 p.a., Grade 3, Schedule E, N.J.I.C. Conditions.

Applications to the Sub-Area Manager, No. 3 Sub-Area, The North Western Electricity Board, Union St, Oldham, by 14 Aug., 1954.

APPOINTMENT OF GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER, ROSSENDALE DISTRICT

Applicants should have had experience on industrial and domestic installations, repair and maintenance of appliances and general commercial duties.

Preference given to candidates who possess the H.N.C. in Electrical Engineering.

Salary Scale: £524/£540 p.a., Grade E.11, N.J.B. Conditions.

Applications to Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee St, Blackburn, by 14 Aug., 1954. (K 584)

YORKSHIRE ELECTRICITY BOARD
No. 3 (Sheffield) Sub-Area

Sheffield South District

GENERAL ASSISTANT DISTRICT ENGINEER

APPLICANTS must hold at least the Higher National Certificate in Electrical Engineering and should have had experience in construction and maintenance work, and be able to carry out operation duties on 11 kV and L.V. overhead and underground mains in a district containing a heavy industrial and densely developed residential area surrounded by a rural area.

Salary—N.J.B. Class H, Grade 11, £607/£628 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 19 Aug., 1954.

No. 1 (Bradford) Sub-Area

SECOND ASSISTANT ENGINEER (METERS, TESTING AND PROTECTION)

Applicants should possess technical qualifications equivalent to those for corporate membership of the Institution of Electrical Engineers, and have such experience as will enable them efficiently to assist with the control of the Sub-Area Meters, Testing and Protection Department with especial concern for fault location on systems operating at various voltages up to 66 kV.

Salary—N.J.B. Class K, Grade 7, £869/£907 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Rd, Bradford, not later than 19 Aug., 1954.

No. 5 (Wakefield) Sub-Area

SECOND ASSISTANT ENGINEER (CONSTRUCTION)

Applicants must be fully experienced in site supervision of all types of direct or remote control substation equipment with ancillary gear up to and including 66 kV and be competent to programme work and deal with correspondence on any technical matters arising therefrom. Experience on Industrial, Urban and Rural systems of both overhead and underground constructions to voltages up to 33 kV is also desirable. Knowledge of supervisory control systems would be an advantage.

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Salary—N.J.B. Class K, Grade 7, £869/£907 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield), Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 19 Aug., 1954.

No. 7 (Grimsby) Sub-Area

SENIOR ASSISTANT (BILLING AND RENTALS)

Applicants should have a thorough knowledge of billing procedure in respect of Domestic, Commercial and Industrial consumers, and the maintenance of debtors controls of all types including hire purchase. They should be conversant with punched card methods of billing and have experience in the supervision of staff.

The possession of an accountancy qualification will be an advantage.

Salary—N.J.C. Grade 5, £670/£20/£730 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby), Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 19 Aug., 1954. (K 606)

BRITISH ELECTRICITY AUTHORITY
North West, Merseyside and N. Wales Division

APPLICATIONS are invited for the appointment of GENERAL ASSISTANT ENGINEER (Civil Engineering) in the Liverpool Office of the Construction Department, Springwood House, Liverpool. Salary £501/£639 per annum Class AX, Grade 8, Schedule "C," N.J.B. Superannuable and subject to medical examination.

Applicants should preferably have the Higher National Certificate and preferably be Student or Graduate Members of an appropriate Institution. Some experience in the design and construction of power stations or in the works of a manufacturer of power station equipment is desirable. The successful applicant will be required to assist in the design and construction of power stations, including the preparation of specifications, checking tenders, handling contracts, and general supervision of constructions.

Application Forms may be obtained from the Divisional Controller, Beaconsfield Rd, Woolton, Liverpool. Closing date: 18 Aug., 1954. (K 589)

BRITISH ELECTRICITY AUTHORITY
South Wales Division

Vacancy No. 79/54

APPLICATIONS invited for superannuable N.J.B. appointment of FIRST ASSISTANT STATION CHEMIST, Cardiff Power Station. Salary F.9, £607/£629 per annum.

Degree in Chemistry or equivalent, and experience in water treatment, coal and oil testing and corrosion problems desirable.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 16 Aug., 1954. (K 601)

BRITISH ELECTRICITY AUTHORITY
North West, Merseyside and N. Wales Division

VACANCY No. 134/54—ASSISTANT SHIFT CHARGE ENGINEER, Kearsley Generating Station. Salary £766/£796 (K.9).

Vacancy No. 135/54—GENERAL ASSISTANT ENGINEER, Planning and Development Section, Technical Department. Salary £501/£714 (AX/EX.8). Candidates should preferably hold an engineering degree or H.N.C. Works experience in switchgear and protection an advantage.

Apply, quoting Vacancy No. to Controller, British Electricity Hse, 825 Wilmslow Rd, Manchester 20, before 14 Aug. (K 607)

BRITISH ELECTRICITY AUTHORITY
South Wales Division

Vacancy No. 80/54

APPLICATIONS invited for superannuable N.J.B. appointment of STATION SHIFT CONTROL ENGINEER at Tir John Power Station. Salary Class H.10, £641/£667 per annum.

H.N.C. and experience in Power Station Control Room desirable.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 23 Aug., 1954.

30 July, 1954. (K 616)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER required in the Northwich District. Salary £587/£600 per annum (N.J.B. Class E, Grade 9). The appointment is superannuable and subject to medical examination.

Applicants should have had experience in H.T. and L.T. Overhead and Underground Distribution work, and preferably have the technical qualifications to enable them to become Chartered Electrical Engineers. Successful applicants may be required to undertake standby duties.

Application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, Nr. Northwich, Cheshire. Closing date 16 Aug., 1954. (K 617)

BRITISH ELECTRICITY AUTHORITY

require ASSISTANT to The Regional Safety Officer, in Manchester Area.

Applicants should have good engineering qualifications, a knowledge of the Factories Acts and Safety Regulations and preferably some experience in accident prevention in the Supply Industry.

Duties include assisting in making recommendations for safety measures and reporting on accidents.

Salary N.J.B. Grade 3, £800/£1,056 according to qualifications and experience, rising to maximum of £1,159.

Applications stating age, present salary and giving full details of qualifications and experience, to D. Moffat, Director of Establishments, Winsley St, London, W.1, by 18 Aug., 1954. Please quote Ref. ET/500. (K 615)

BRITISH ELECTRICITY AUTHORITY

require THIRD ASSISTANT ENGINEER or PHYSICIST at the Research Laboratories, Leatherhead.

Candidates should have a University Degree in Electrical Engineering or in Physics, and some research experience is desirable.

Duties include testing, development and research work in the Laboratories and in the field in connection with the generation, transmission and distribution of electricity.

Salary within N.J.B. Grade 4, £717/£852 p.a. according to qualifications and experience, rising to a maximum of £934 p.a.

Applications stating age, qualifications, experience and present position and salary to D. Moffat, Director of Establishments, Winsley St, London, W.1, to be received by 20 Aug., 1954. Please quote Ref. ET/501. (K 619)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

POWER STATION SUPERINTENDENT

APPLICATIONS are invited from suitably qualified engineers for the position of Power Station Superintendent at the Derby Generating Station. Candidates for this position should have had considerable experience in the operation and management of a modern Generating Station and should also have had experience of Pulverised Fuel Firing.

The salary will be in accordance with the National Joint Managerial and Higher Executives Grades Agreement—Scale 1 (£1,150/

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£1,300 per annum) and the appointment will be pensionable under the British Electricity Authority and Area Boards Superannuation Scheme.

Application forms may be obtained from the Divisional Establishments Officer, British Electricity Authority, British Electricity Hse., P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by 18 Aug., 1954. Please quote Vacancy No. 116/54/ET.

L. F. JEFFREY,
Divisional Controller.
(K 593)

BRITISH ELECTRICITY AUTHORITY
South Eastern Division

ASSISTANT SHIFT CHARGE ENGINEER—Littlebrook Power Station. Applicants should possess technical qualifications equivalent to graduate membership of either the Institution of Mechanical or Electrical Engineers. Experience in the efficient operation of modern high-pressure Power Station plant with P.F. firing and experience in administration and control of labour essential. Assistance with housing may be possible for those living at present in rented property. Class M, Grade 9—£906. 3s. per annum. Applications, giving details of education, present position, experience, etc., should be received by the Station Superintendent, Littlebrook Power Station, Near Dartford, Kent, by the 13 Aug., 1954. (K 583)

BRITISH ELECTRICITY AUTHORITY

require ASSISTANT STATISTICIAN in the Technical Engineering and Statistics Section of the Generation Operation Branch at Headquarters in London.

Candidates should have ability in mathematics, experience of statistical methods of analysis, and be able to draw conclusions from numerical data and prepare reports, also the organisation of computations. Experience of power station practice would be an advantage.

Salary scale N.J.B. Grade 8, £935/£1,040 p.a. inclusive.

Applications stating age, qualifications, experience, present position and salary to D. Moffat. Director of Establishments, Winsley St, London, W.1, not later than 24 Aug., 1954. Please quote Ref. ET/502. (K 618)

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BRUCE PEEBLES AND CO., LTD., Engineers, Edinburgh, 5, invite applications for the following positions:

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ASSISTANT DESIGNER experienced in design of distribution and medium size power transformers. Salary commensurate with experience.

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2. SENIOR SWITCHGEAR DRAUGHTSMAN.
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3. TECHNICAL SALES ENGINEER.
   Candidates should have a technical background, preferably not less than Higher National Certificate level, and experience in preparing tenders for switchgear up to 33,000 V.
4. TECHNICAL SALES PROMOTION ENGINEER.
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Forms from D. Moffat, Director of Establishments, British Electricity Authority, Winsley St, W.1, to be returned by 28 Aug. Quote Ref.: ET./499. (K 608)

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Vacancies also exist for graduate-apprentices wishing to undertake a planned two-year course of training for design, research and development, production or sales, prior to National Service. Ref. PGA.

The Company operates a Staff Pension Scheme. Application forms from Mr T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. Please quote appropriate reference. (K 575)

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JUNIOR DRAUGHTSMEN required by manufacturers of medium voltage switchgear. 5-day week and superannuation scheme. State age, technical qualifications, and salary required to Ottermill Switchgear Ltd., Ottery St. Mary, Devon. (K 501)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2.

JUNIOR LIGHTING ENGINEER preferably with Electrical Background required by large manufacturers of Lighting equipment. Write stating age, experience and salary required to Box 330, Allardyce Palmer Ltd., 109 Kingsway, London, W.C.2. (K 613)

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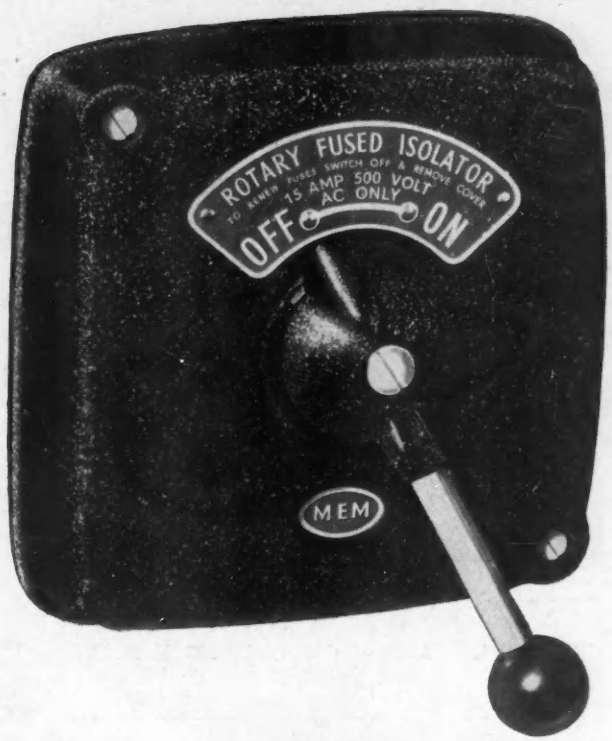

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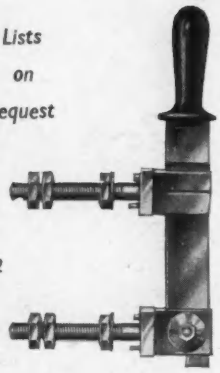

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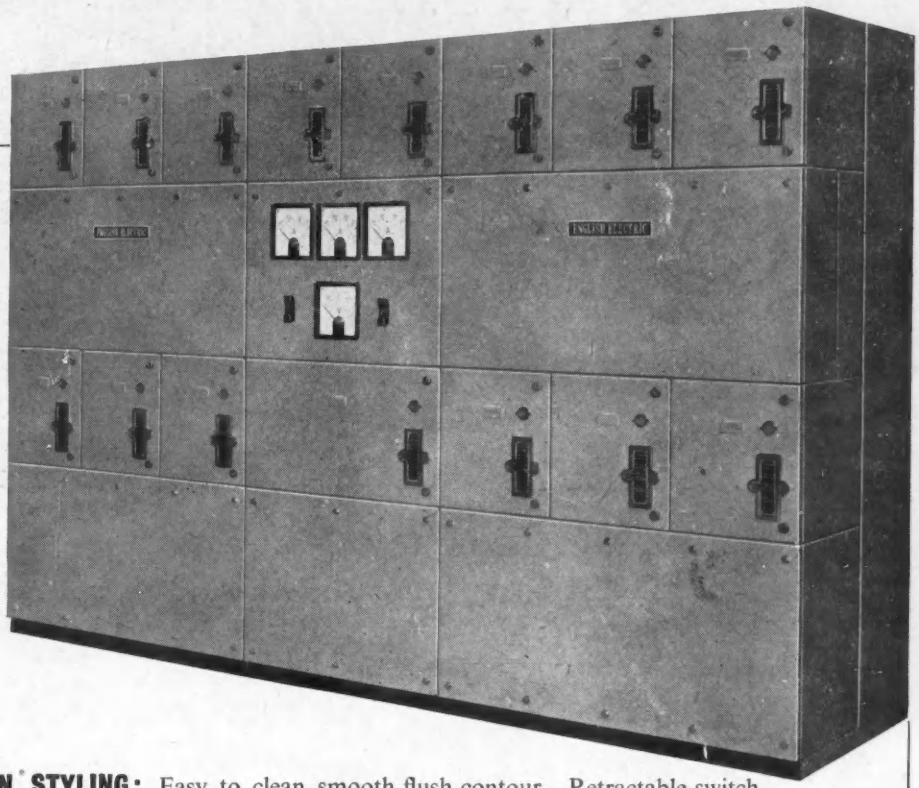

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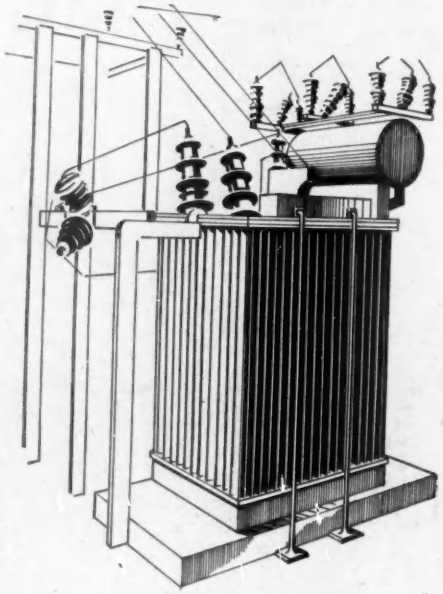

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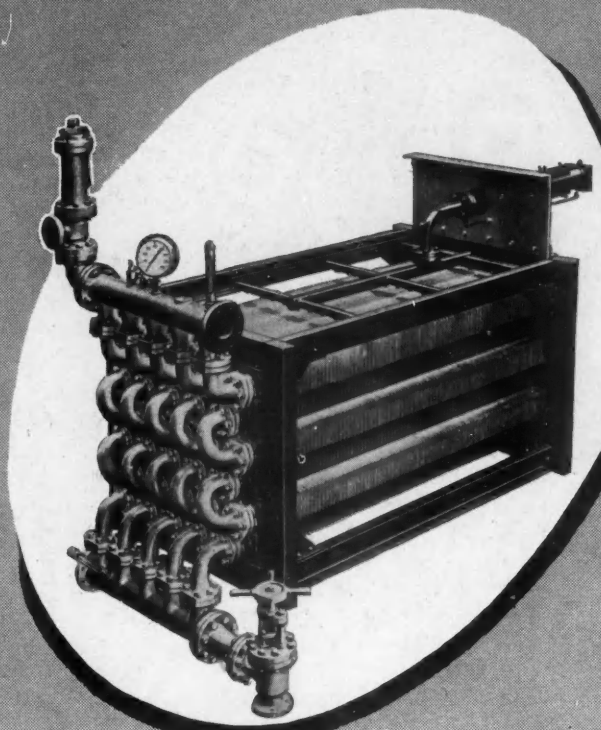

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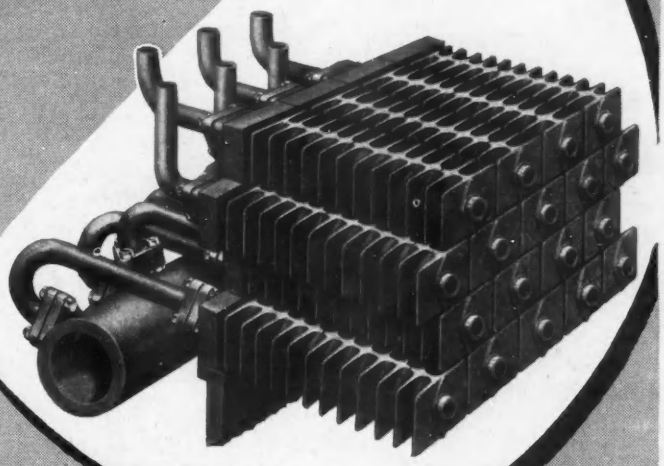

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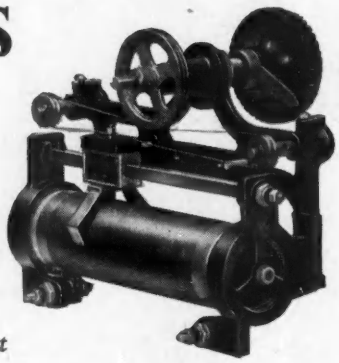

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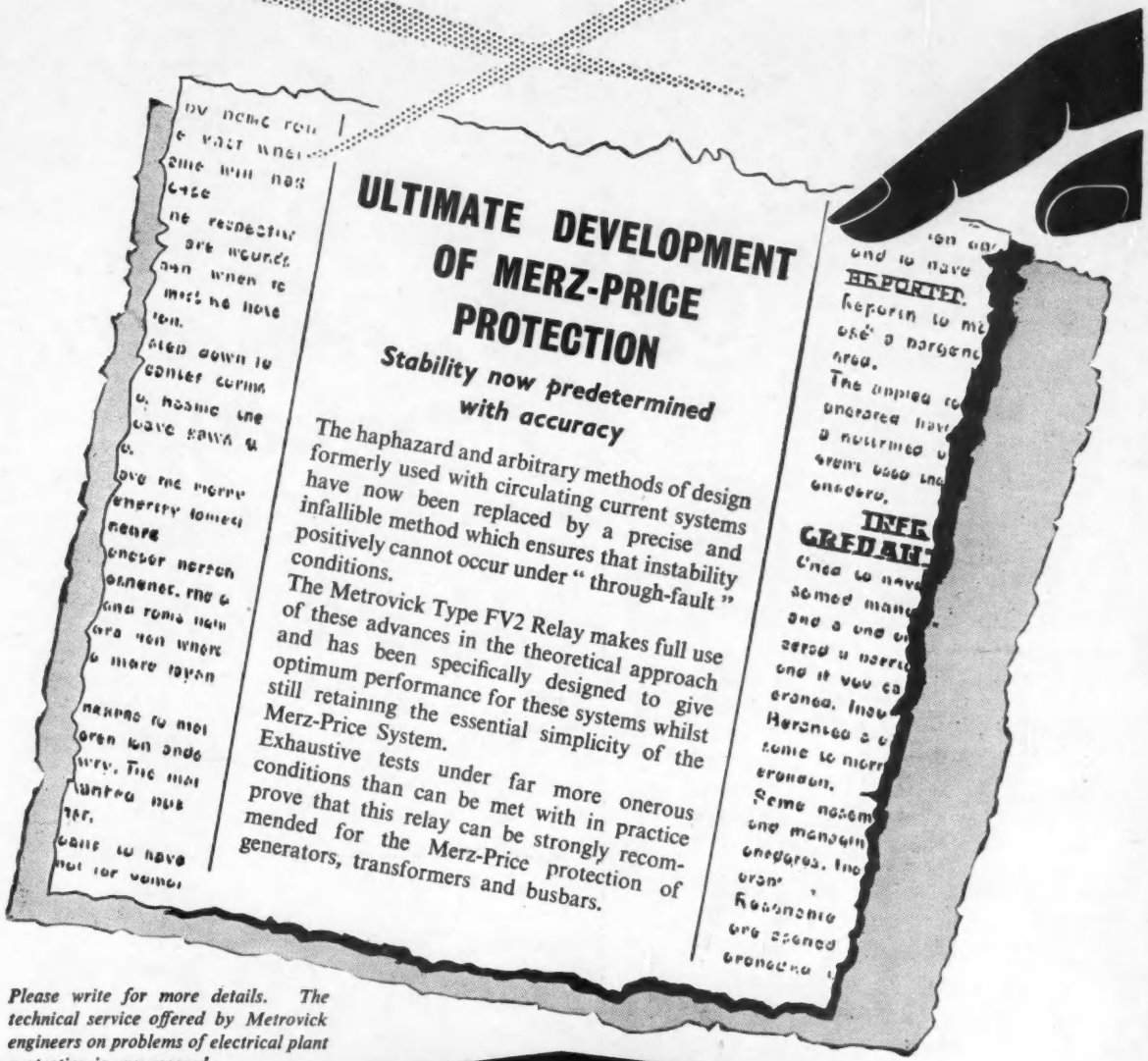
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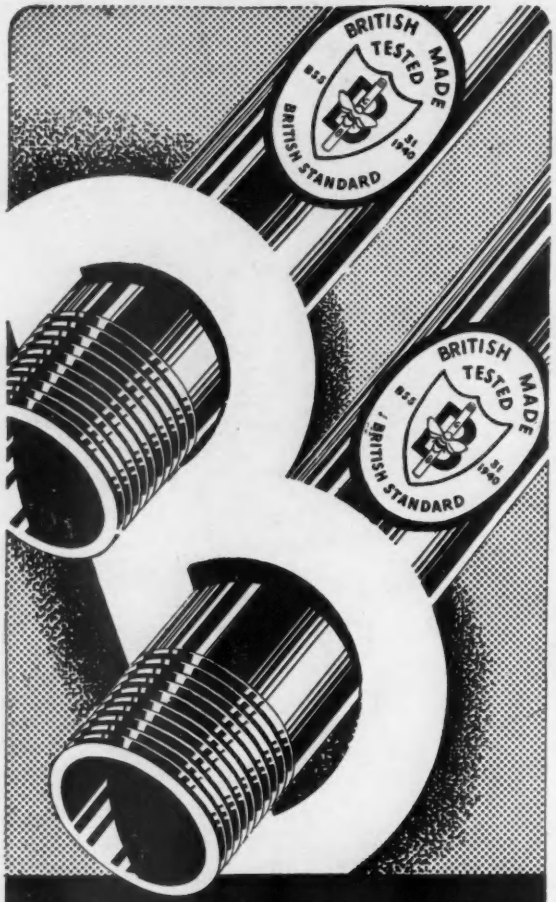

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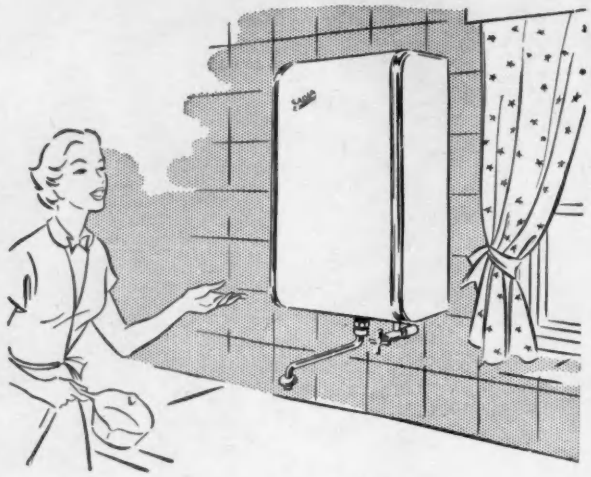

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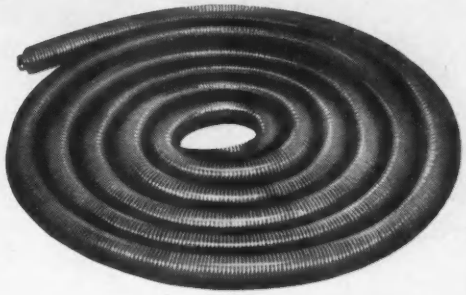
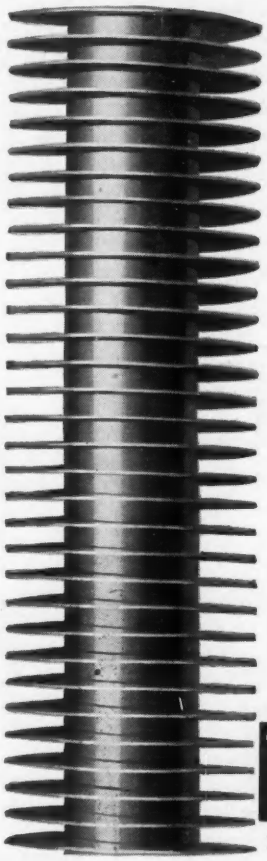
'INTEGRON' Integral finned tubing





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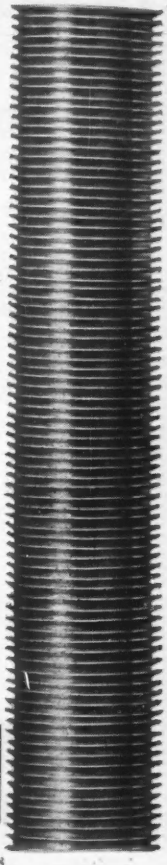

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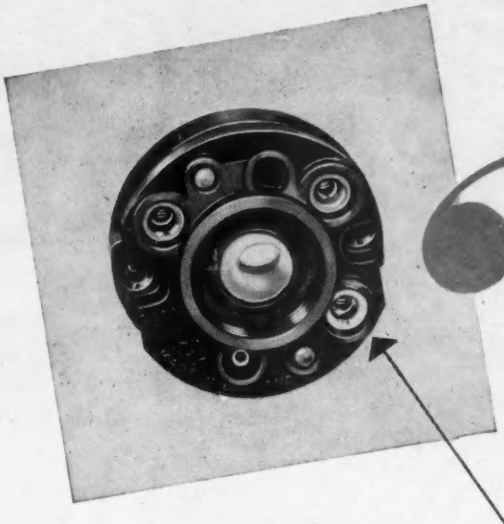

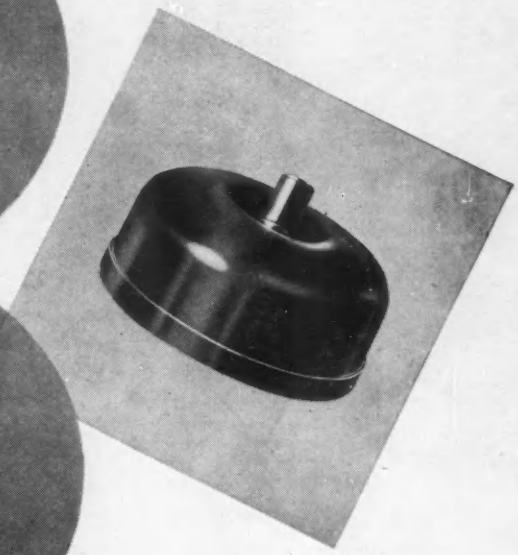

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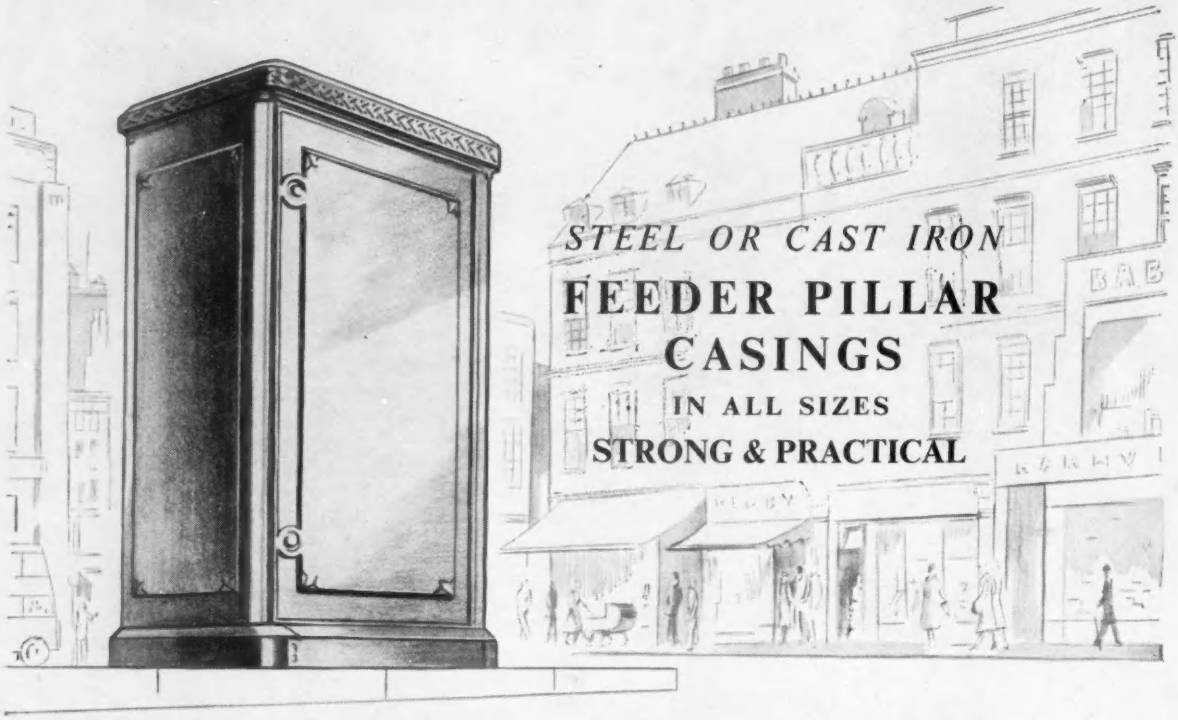

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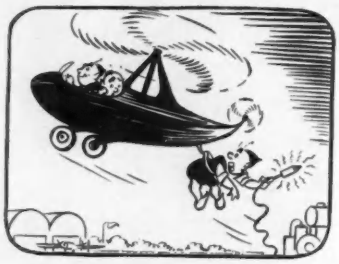

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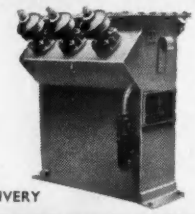

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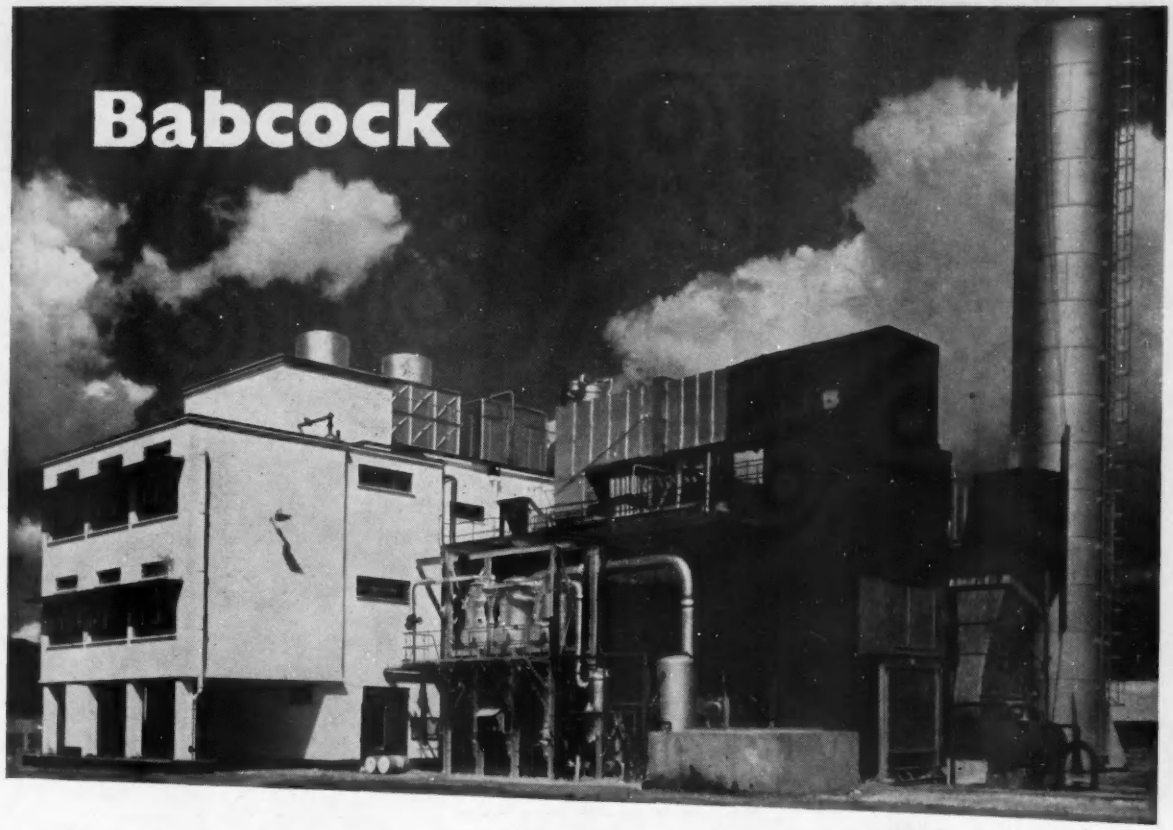
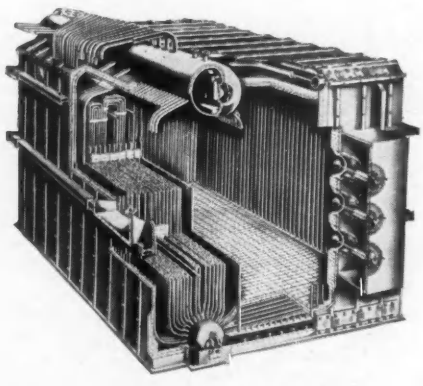


"outdoor" boiler installations

Above: *'Outdoor' boiler installation comprising a 130,000 lb./hr. oil-fired Babcock Integral Furnace boiler, at Hunts Bay power station, Jamaica. Consulting Engineers: Ewbank & Partners.*

Below: *Sectional view of an oil-fired Babcock Integral Furnace boiler.*



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* *Ask for Publication 1525*

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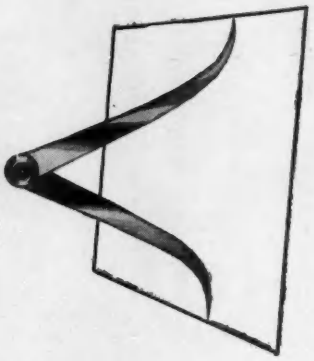

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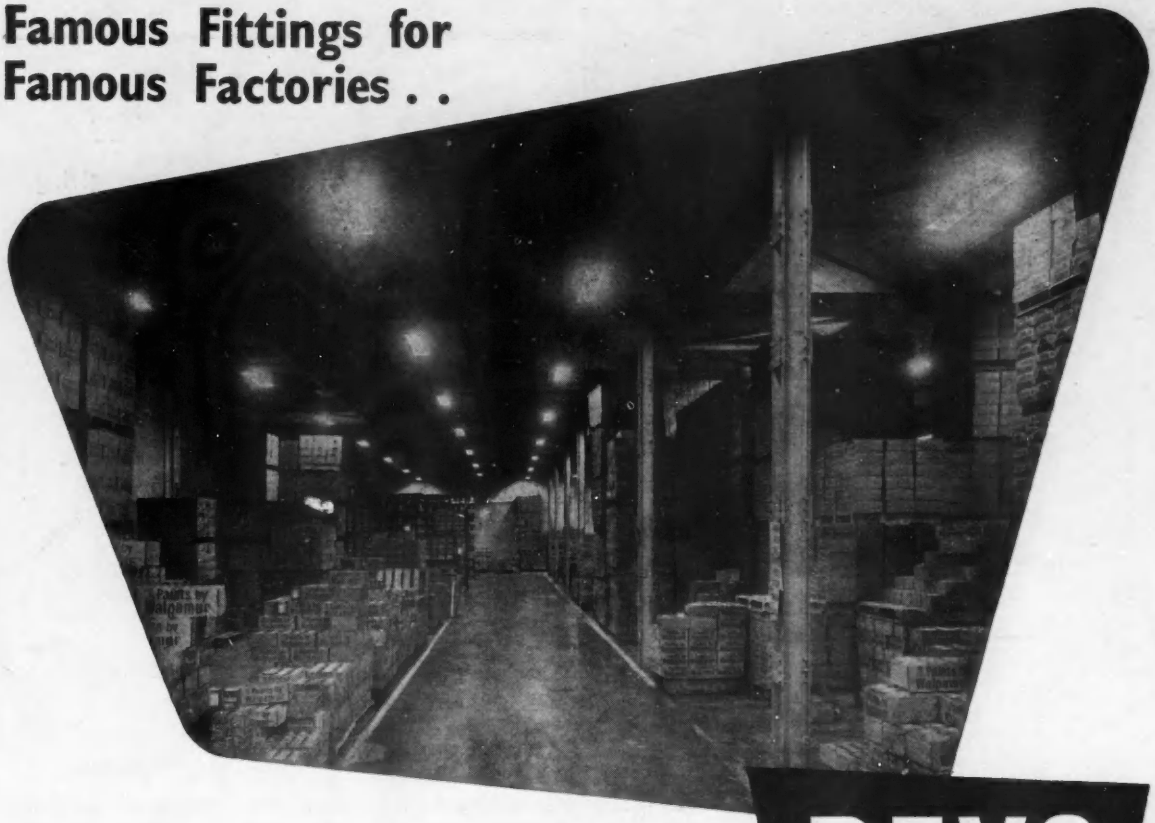

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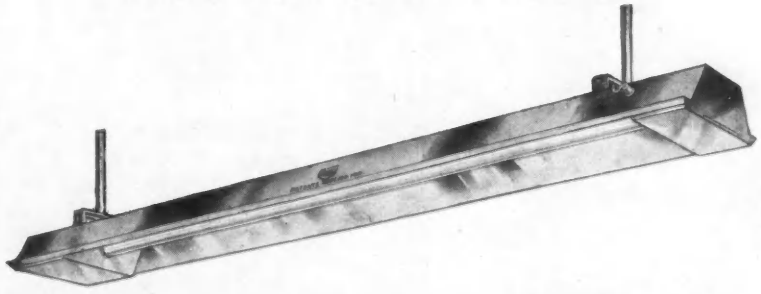

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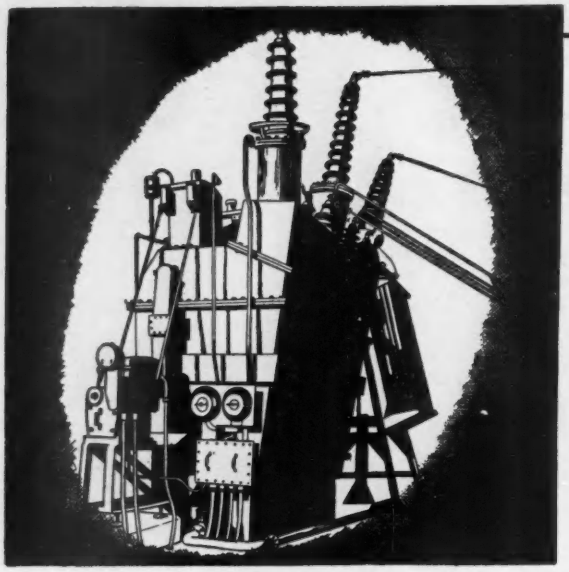

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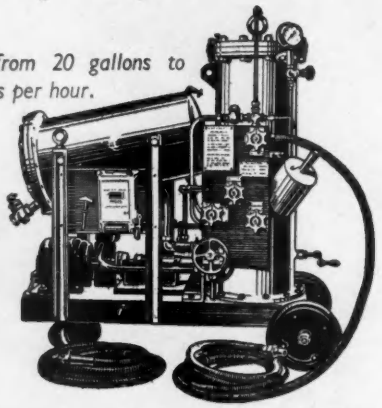

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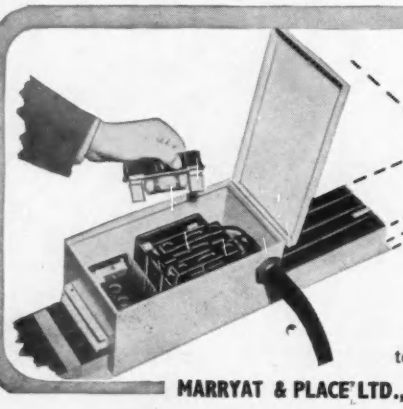

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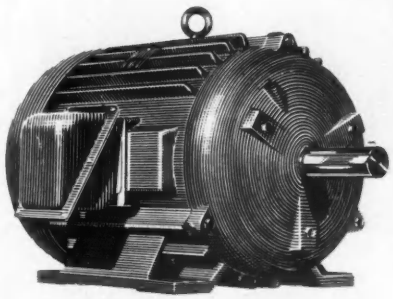

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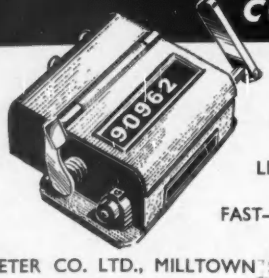

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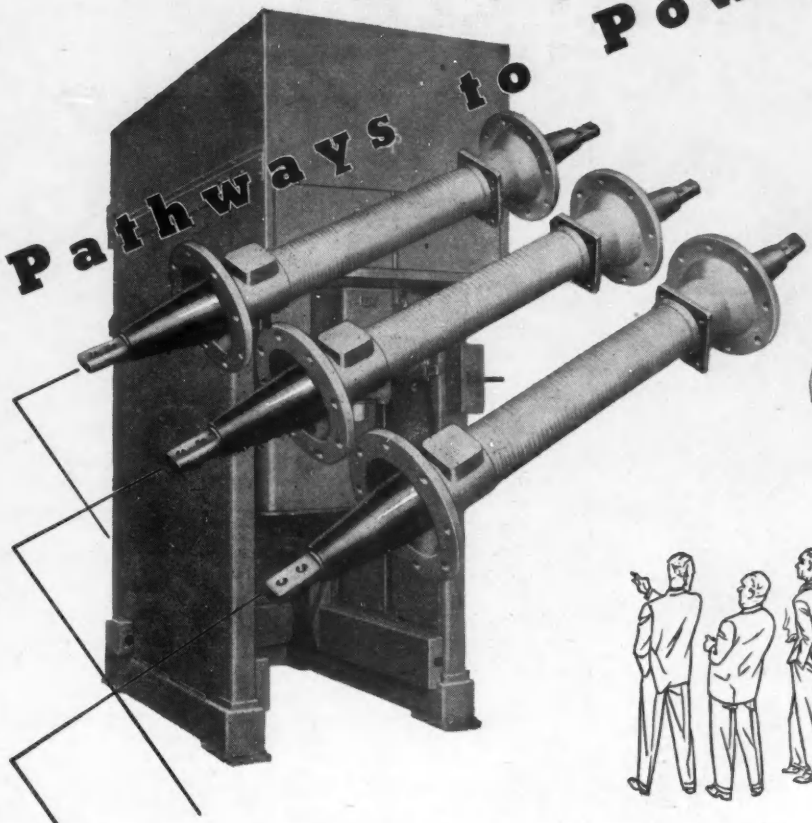

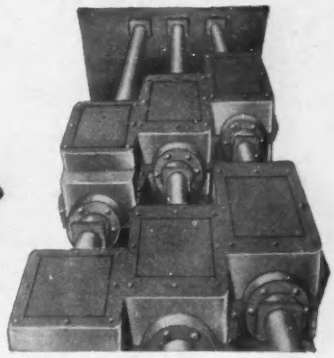

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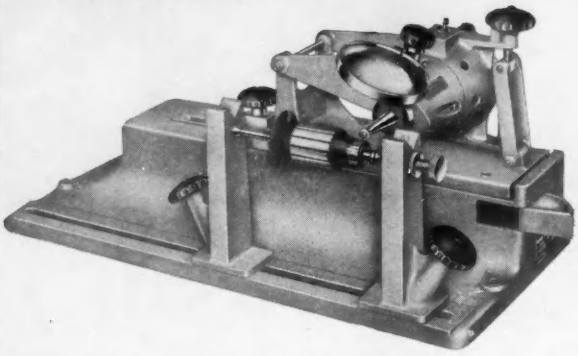

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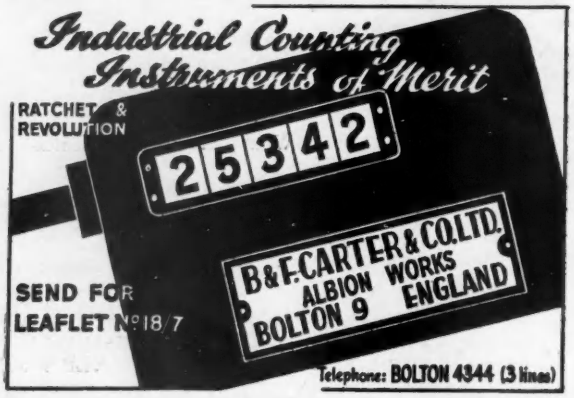

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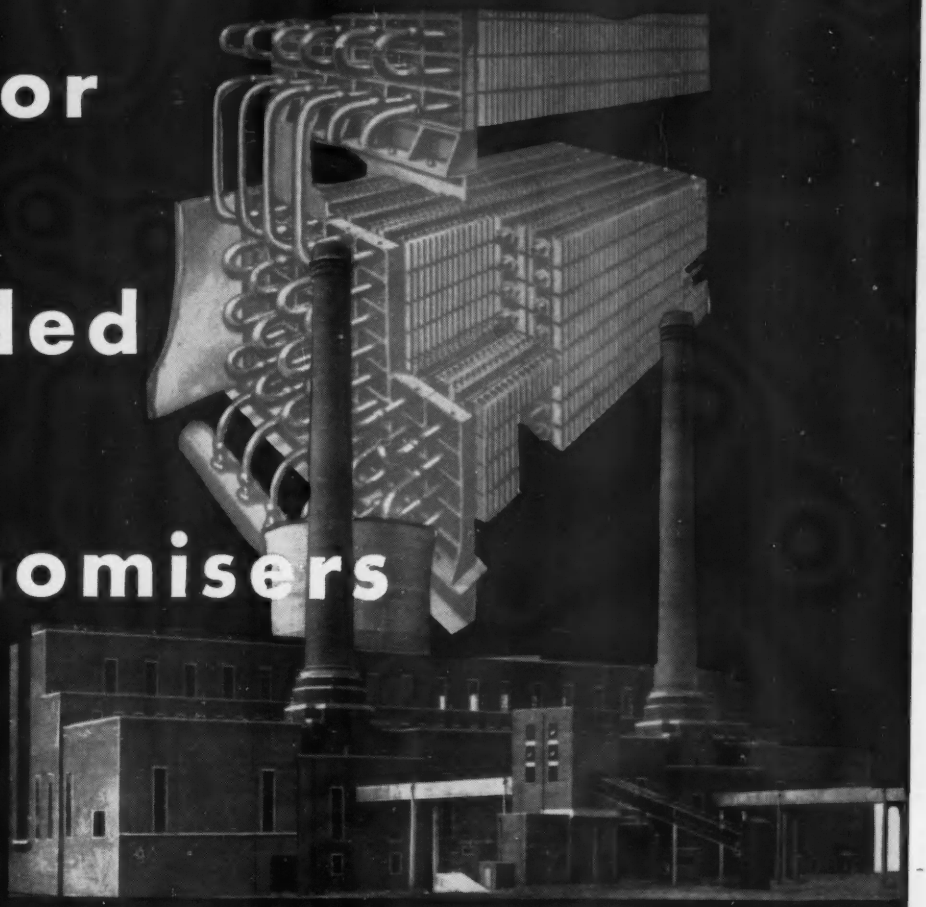

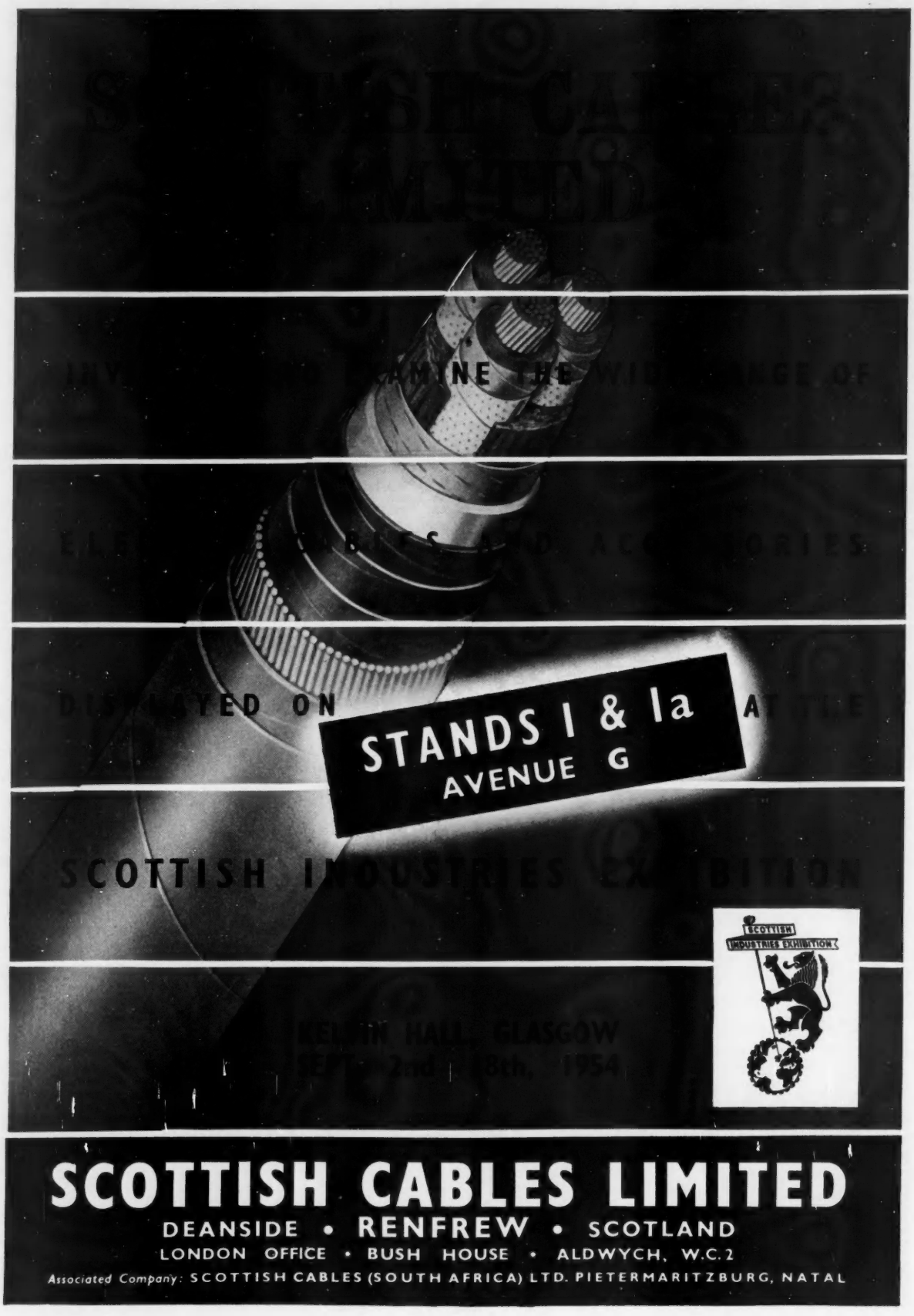

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